

Network Working Group  
Internet-Draft  
Intended status: Informational  
Expires: December 20, 2017

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June 18, 2017

Generic Policy Data Model for  
Simplified Use of Policy Abstractions (SUPA)  
draft-ietf-supa-generic-policy-data-model-04

## Abstract

This document defines two YANG policy data modules. The first is a generic policy model that is meant to be extended on an application-specific basis. The second is an exemplary extension of the first generic policy model, and defines rules as event-condition-action policies. Both models are independent of the level of abstraction of the content and meaning of a policy.

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## [1.](#) Overview

This document defines two YANG [[RFC6020](#)] [[RFC6991](#)] policy data models. The first is a generic policy model that is meant to be extended on an application-specific basis. It is derived from the Generic Policy Information Model (GPIM) defined in [[1](#)]. The second is an exemplary extension of the first (generic policy) model, and defines policy rules as event-condition-action tuples. Both models are independent of the level of abstraction of the content and meaning of a policy.

The GPIM defines a common framework as a set of model elements (e.g., classes, attributes, and relationships) that specify a common set of policy management concepts that are independent of the type of policy (e.g., imperative, procedural, declarative, or

otherwise). The first YANG data model is a translation of the GPIM to a YANG module. The ECA Policy Rule Information Model (EPRIM), also defined in [1], extends the GPIM to represent policy rules that use the Event-Condition-Action (ECA) paradigm. The second YANG data model maps the EPRIM to YANG. The second YANG data model MAY be used to augment the functionality of the first YANG data model.

## [2.](#) Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119]. In this document, these words will appear with that interpretation only when in ALL CAPS. Lower case uses of these words are not to be interpreted as carrying [RFC2119] significance.

## [3.](#) Terminology

This section defines acronyms, terms, and symbology used in the rest of this document.

### [3.1.](#) Acronyms

CNF	Conjunctive Normal Form
DNF	Disjunctive Normal Form
ECA	Event-Condition-Action
EPRIM	(SUPA) ECA Policy Rule Information Model [1]
FQDN	Fully Qualified Domain Name
FQPN	Fully Qualified Path Name
GPIM	(SUPA) Generic Policy Information Model [1]
GUID	Globally Unique Identifier
NETCONF	Network Configuration protocol
OAM&P	Operations, Administration, Management, and Provisioning
OCL	Object Constraint Language [2] [3]
OID	Object Identifier
SUPA	Simplified Use of Policy Abstractions

UML	Unified Modeling Language
URI	Uniform Resource Identifier
UUID	Universally Unique Identifier

### [3.2.](#) Definitions

Action: a set of activities that have a set of associated behavior.

Boolean Clause: a logical statement that evaluates to either TRUE or FALSE. Also called Boolean Expression.

Condition: a set of attributes, features, and/or values that are to be compared with a set of known attributes, features, and/or values in order to make a decision. A Condition, when used in the context of a Policy Rule, is used to determine whether or not the set of Actions in that Policy Rule can be executed or not.

Constraint: A constraint is a limitation or restriction. Constraints may be added to any type of object (e.g., events, conditions, and actions in Policy Rules).

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SUPA Generic Policy YANG Data Model

June 2017

Data Model: a data model is a representation of concepts of interest to an environment in a form that is dependent on data repository, data definition language, query language, implementation language, and protocol (typically one or more of these). This definition is taken from [\[1\]](#).

ECA: Event - Condition - Action (a type of policy).

Event: an Event is defined as any important occurrence in time in the system being managed, and/or in the environment of the system being managed. An Event may represent the changing or maintaining of the state of a managed object. An Event, when used in the context of a Policy Rule, is used to determine whether the Condition clause of an imperative (i.e., ECA) Policy Rule can be evaluated or not.

FQPN (Fully Qualified Path Name)

The specification of a path to a file in a system that unambiguously resolves to only that specific file. In this sense, "fully qualified" is independent of context. However, in a distributed system, it may be dependent on the specific format of an operating system. Hence, implementations should consider such issues before allowing the use of FQPNs.

Information Model: an information model is a representation of concepts of interest to an environment in a form that is independent of data repository, data definition language, query language, implementation language, and protocol. This definition is taken from [1].

Metadata: metadata is data that provides descriptive and/or prescriptive information about the object(s) to which it is associated. This enables structure and content of the object(s) to which it applies, as well as usage and other information, to be represented in an extensible manner. It avoids "burying" common information in specific classes, and increases reuse.

SUPAPolicy: A SUPAPolicy is, in this version of this document, an ECA policy rule that MUST contain an ECA policy rule, SHOULD contain one or more SUPAPolicyMetadata objects, and MAY contain other elements that define the semantics of the policy rule. An ECA Policy Rule MUST contain an event clause, a condition clause, and an action clause. Policies are generically defined as a means to monitor and control the changing and/or maintaining of the state of one or more managed objects. This definition is based on the definition of SUPAPolicy in [1].

### [3.3.](#) Symbology

The following representation is used to describe YANG data modules defined in this draft.

- o Brackets "[" and "]" enclose list keys.
- o Abbreviations before data node names: "rw" means configuration data (read-write), and "ro" means state data (read-only).
- o Symbols after data node names: "?" means an optional node, "!" means a presence container, and "\*" denotes a list and leaf-list.
- o Parentheses enclose choice and case nodes, and case nodes are also

marked with a colon (":").

- o Ellipsis ("...") stands for contents of subtrees that are not shown.

#### [4.](#) Design of the SUPA Policy Data Models

This section describes the design philosophy of the YANG data model, and how they will be maintained.

##### [4.1.](#) Objectives

These Data Models are derived from the SUPA Generic Policy Information Model [\[1\]](#). The overall objective is to faithfully transform that information model into a YANG data model that can be used for communicating policy. The policy scope to be covered is that defined by [\[1\]](#); please refer to it for more details and background information.

This model is an extensible framework that is independent of the implementation approach for storing policies, as well as being independent of the content and meaning of specific policies. These models can be extended (generally by using the groupings here and defining additional containers for concrete classes) to represent domain- and/or application-specific policies. The ECA model in this document is an example of extending the general policy model towards specific policies.

By using this approach, different policy models will use common semantics, enabling them to be more easily integrated.

One of the important goals of this work is for the semantics of these models to align with those of the generic policy information model. Thus, most of this model was generated by a quasi-algorithmic transformation of the information model. This was done by hand. Certain changes were made to reflect the fact that this is a YANG data model, and therefore, does not need to generically allow for all data modelling languages. Details of the process are described

below in [section 4.3](#).

## [4.2](#) Yang Data Model maintenance

All model changes should be done to both the information model and the data model in parallel. Care is being taken during development of this model to ensure that is the case.

In general, structural changes will be applied to both the information model and the data model, and then any necessary YANG repairs taken to preserve the validity of the YANG data model.

## [4.3](#) YANG Data Model Overview

This YANG data model is generated by applying suitable YANG constructs to represent the information in the information model.

There are three key information modeling concepts that this data model needs to represent consistently. These are classes, class inheritance (also known as subclassing) and associations. The SUPA generic policy information model [[1](#)] makes extensive use of these concepts.

Each class in the model is represented by a YANG identity and by a YANG grouping. The use of groupings enables us to define these classes abstractly. Each grouping begins with two leaves (either defined in the grouping or inherited via a uses clause), which provide common functionality. One leaf is used for the system-wide unique identifier for this instance. This is either named supa-policy-ID (for the SUPAPolicyObject tree, which contains everything EXCEPT metadata objects) or supa-policy-metadata-id (for the SUPAPolicyMetadata tree, which ONLY contains metadata). All associations use supa-policy-IDs. The second leaf is always called the entity-class. It is an identityref which is set to the identity of the instance. The default value for this leaf is always correctly defined by the grouping. It is read-write in the YANG formalism due to restrictions on the use of MUST clauses.

Class inheritance (or subclassing) is done by defining an identity and a grouping for the new class. The identity is based on the parent identity, and is given a new name to represent this class. The new grouping uses the parent grouping. It refines the entity-class of the parent, replacing the default value of the entity-class with the correct value for this class.

Associations are represented by the use of instance-identifiers and association classes. Association classes are classes, using the above construction, which contain leaves representing the set of instance-identifiers for each end of the association, along with any other properties the information model assigns to the association. The two associated classes each have a leaf with an instance-identifier that points to the association class instance. Each instance-identifier leaf is defined with a must clause. That must clause references the entity-class of the target of the instance-identifier, and specifies that the entity class type must be the same as, or subclassed from, a specific named class. Thus, associations can point to any instance of a selected class, or any instance of any subclass of that target.

While not mandated by the YANG, it is expected that the xpath for the instance-identifier will end with an array selection specifying the supa-policy-ID or supa-policy-metadata-id of the target. This enables us to construct the abstract class tree, with inheritance and associations. It is noted and accepted that this process does lose the distinction between containment, association, and aggregation used by the information model.

The concrete class tree is constructed as follows. The YANG model defines a container for each class that is defined as concrete by the information model. That container contains a single list, keyed by either the supa-policy-id or the supa-policy-metadata-id. The content of the list is defined by a uses clause referencing the grouping that defines the class. After this was done, certain additional modifications were made. Specifically, any information model constructs intended to represent lists of possible values were recast as YANG enumerations. Where these lists are used more than once, they are factored out into reusable enumerations.

Certain attributes that are not needed in the YANG (e.g., to represent the range of choices different data models might use for policy identification) were removed for simplicity and clarity.

#### [4.4.](#) YANG Tree Diagram

The YANG Tree Diagram starts on the next page. It uses the following abbreviations for datatypes:

- B: Boolean
- E: enumeration
- II: instance-identifier
- IR: identityref
- PC: policy-constraint-language-list
- PD: policy-data-type-encoding-list
- PS: policy-deploy-status-list
- S: string



- YD: yang:date-and-time
- UI: uint32

```
module: ietf-supa-policy
```

```

  +--rw supa-encoding-container
  |   +--rw supa-encoding-clause-list* [supa-policy-ID]
  |   |   +--rw entity-class? identityref
  |   |   +--rw supa-policy-ID string
  |   |   +--rw supa-policy-name? string
  |   |   +--rw supa-policy-object-description? string
  |   |   +--rw supa-has-policy-metadata-agg-ptr* instance-identifier
  |   |   +--rw supa-policy-clause-deploy-status identityref
  |   |   +--rw supa-has-policy-clause-part-ptr* instance-identifier
  |   |   +--rw supa-policy-clause-has-decorator-agg-ptr* instance-identifier
  |   |   +--rw supa-encoded-clause-content string
  |   |   +--rw supa-encoded-clause-language enumeration
  +--rw supa-policy-variable-container
  |   +--rw supa-policy-variable-list* [supa-policy-ID]
  |   |   +--rw entity-class? identityref
  |   |   +--rw supa-policy-ID string
  |   |   +--rw supa-policy-name? string
  |   |   +--rw supa-policy-object-description? string
  |   |   +--rw supa-has-policy-metadata-agg-ptr* instance-identifier
  |   |   +--rw supa-policy-clause-has-decorator-part-ptr* instance-identifier
  |   |   +--rw supa-has-decorated-policy-component-part-ptr* instance-identifier
  |   |   +--rw supa-pol-clause-constraint* string
  |   |   +--rw supa-pol-clause-constraint-encoding? identityref
  |   |   +--rw supa-has-decorated-policy-component-agg-ptr* instance-identifier
  |   |   +--rw supa-pol-comp-constraint* string
  |   |   +--rw supa-pol-comp-constraint-encoding? identityref
  |   |   +--rw supa-policy-term-is-negated? boolean
  |   |   +--rw supa-policy-variable-name? string
  +--rw supa-policy-operator-container
  |   +--rw supa-policy-operator-container
  |   |   +--rw supa-policy-operator-list* [supa-policy-ID]
  |   |   |   +--rw entity-class? identityref
  |   |   |   +--rw supa-policy-ID string
  |   |   |   +--rw supa-policy-name? string
  |   |   |   +--rw supa-policy-object-description? string
  |   |   |   +--rw supa-has-policy-metadata-agg-ptr* instance-identifier
  |   |   |   +--rw supa-policy-clause-has-decorator-part-ptr* instance-identifier
  |   |   |   +--rw supa-has-decorated-policy-component-part-ptr* instance-identifier
  |   |   |   +--rw supa-pol-clause-constraint* string
  |   |   |   +--rw supa-pol-clause-constraint-encoding? identityref
  |   |   |   +--rw supa-has-decorated-policy-component-agg-ptr* instance-identifier

```

	++-rw supa-pol-comp-constraint*	string
	++-rw supa-pol-comp-constraint-encoding?	identityref
	++-rw supa-policy-term-is-negated?	boolean
	++-rw supa-policy-value-op-type	enumeration
+-rw supa-policy-value-container		
	++-rw supa-policy-value-list* [supa-policy-ID]	
	++-rw entity-class?	identityref
	++-rw supa-policy-ID	string
	++-rw supa-policy-name?	string
	++-rw supa-policy-object-description?	string

	++-rw supa-has-policy-metadata-agg-ptr*	instance-identity
	++-rw supa-policy-clause-has-decorator-part-ptr*	instance-identity
	++-rw supa-has-decorated-policy-component-part-ptr?	instance-identity
	++-rw supa-pol-clause-constraint*	string
	++-rw supa-pol-clause-constraint-encoding?	identityref
	++-rw supa-has-decorated-policy-component-agg-ptr*	instance-identity
	++-rw supa-pol-comp-constraint*	string
	++-rw supa-pol-comp-constraint-encoding?	identityref
	++-rw supa-policy-term-is-negated?	boolean
	++-rw supa-policy-value-content*	string
	++-rw supa-policy-value-encoding?	identityref
+-rw supa-policy-generic-decorated-container		
	++-rw supa-encoding-clause-list* [supa-policy-ID]	
	++-rw entity-class?	identityref
	++-rw supa-policy-ID	string
	++-rw supa-policy-name?	string
	++-rw supa-policy-object-description?	string
	++-rw supa-has-policy-metadata-agg-ptr*	instance-identity
	++-rw supa-policy-clause-has-decorator-part-ptr*	instance-identity
	++-rw supa-has-decorated-policy-component-part-ptr?	instance-identity
	++-rw supa-pol-clause-constraint*	string
	++-rw supa-pol-clause-constraint-encoding?	identityref
	++-rw supa-has-decorated-policy-component-agg-ptr*	instance-identity
	++-rw supa-pol-comp-constraint*	string
	++-rw supa-pol-comp-constraint-encoding?	identityref
	++-rw supa-policy-generic-decorated-content*	string
	++-rw supa-policy-generic-decorated-encoding?	identityref
+-rw supa-policy-source-container		
	++-rw supa-policy-source-list* [supa-policy-ID]	
	++-rw entity-class?	identityref
	++-rw supa-policy-ID	string
	++-rw supa-policy-name?	string
	++-rw supa-policy-object-description?	string
	++-rw supa-has-policy-metadata-agg-ptr*	instance-identifier

```

|      +--rw supa-has-policy-source-part-ptr*      instance-identifier
+--rw supa-policy-target-container
|  +--rw supa-policy-target-list* [supa-policy-ID]
|      +--rw entity-class?                          identityref
|      +--rw supa-policy-ID                          string
|      +--rw supa-policy-name?                       string
|      +--rw supa-policy-object-description?         string
|      +--rw supa-has-policy-metadata-agg-ptr*       instance-identifier
|      +--rw supa-has-policy-target-part-ptr*        instance-identifier
+--rw supa-policy-concrete-metadata-container
|  +--rw supa-policy-concrete-metadata-list* [supa-policy-metadata-id]
|      +--rw entity-class?                          identityref
|      +--rw supa-policy-metadata-id                 string
|      +--rw supa-policy-metadata-description?       string
|      +--rw supa-policy-metadata-name?              string
|      +--rw supa-has-policy-metadata-part-ptr*       instance-identifier
|      +--rw supa-has-policy-metadata-dec-part-ptr*   instance-identifier
|      +--rw supa-policy-metadata-valid-period-end?  yang:date-and-time

```

```

|      +--rw supa-policy-metadata-valid-period-start? yang:date-and-time
+--rw supa-policy-metadata-decorator-access-container
|  +--rw supa-policy-metadata-decorator-access-list* [supa-policy-metadata-id]
|      +--rw entity-class?                          identityref
|      +--rw supa-policy-metadata-id                 string
|      +--rw supa-policy-metadata-description?       string
|      +--rw supa-policy-metadata-name?              string
|      +--rw supa-has-policy-metadata-part-ptr*       instance-identifier
|      +--rw supa-has-policy-metadata-dec-part-ptr*   instance-identifier
|      +--rw supa-has-policy-metadata-dec-agg-ptr?    instance-identifier
+--rw supa-policy-metadata-decorator-version-container
|  +--rw supa-policy-metadata-decorator-version-list* [supa-policy-metadata-id]
|      +--rw entity-class?                          identityref
|      +--rw supa-policy-metadata-id                 string
|      +--rw supa-policy-metadata-description?       string
|      +--rw supa-policy-metadata-name?              string
|      +--rw supa-has-policy-metadata-part-ptr*       instance-identifier
|      +--rw supa-has-policy-metadata-dec-part-ptr*   instance-identifier
|      +--rw supa-has-policy-metadata-dec-agg-ptr?    instance-identifier
+--rw supa-policy-metadata-detail-container
|  +--rw supa-policy-metadata-detail-list* [supa-policy-ID]
|      +--rw entity-class?                          identityref
|      +--rw supa-policy-ID                          string
|      +--rw supa-policy-name?                       string
|      +--rw supa-policy-object-description?         string
|      +--rw supa-has-policy-metadata-agg-ptr*       instance-identifier

```

```

|      +--rw supa-has-policy-metadata-detail-agg-ptr?          instance-ide
|      +--rw supa-has-policy-metadata-detail-part-ptr?        instance-ide
|      +--rw supa-policy-metadata-detail-is-applicable?       boolean
|      +--rw supa-policy-metadata-detail-constraint*          string
|      +--rw supa-policy-metadata-detail-constraint-encoding? identityref
+--rw supa-policy-clause-has-decorator-detail-container
|  +--rw supa-policy-component-decorator-detail-list* [supa-policy-ID]
|      +--rw entity-class?                                    identityref
|      +--rw supa-policy-ID                                    string
|      +--rw supa-policy-name?                                  string
|      +--rw supa-policy-object-description?                  string
|      +--rw supa-has-policy-metadata-agg-ptr*               instance-identi
|      +--rw supa-has-policy-component-decorator-agg-ptr?    instance-identi
|      +--rw supa-has-policy-component-decorator-part-ptr?   instance-identi
|      +--rw supa-has-decorator-constraint*                  string
|      +--rw supa-has-decorator-constraint-encoding?         identityref
+--rw supa-policy-component-decorator-detail-container
|  +--rw supa-policy-component-decorator-detail-list* [supa-policy-ID]
|      +--rw entity-class?                                    identityref
|      +--rw supa-policy-ID                                    string
|      +--rw supa-policy-name?                                  string
|      +--rw supa-policy-object-description?                  string
|      +--rw supa-has-policy-metadata-agg-ptr*               instance-identi
|      +--rw supa-has-policy-component-decorator-agg-ptr?    instance-identi
|      +--rw supa-has-policy-component-decorator-part-ptr?   instance-identi
|      +--rw supa-has-decorator-constraint*                  string

```

```

|      +--rw supa-has-decorator-constraint-encoding?          identityref
+--rw supa-policy-source-detail-container
|  +--rw supa-policy-source-detail-list* [supa-policy-ID]
|      +--rw entity-class?                                    identityref
|      +--rw supa-policy-ID                                    string
|      +--rw supa-policy-name?                                  string
|      +--rw supa-policy-object-description?                  string
|      +--rw supa-has-policy-metadata-agg-ptr*               instance-identifier
|      +--rw supa-has-policy-source-detail-agg-ptr?          instance-identifier
|      +--rw supa-has-policy-source-detail-part-ptr?         instance-identifier
|      +--rw supa-policy-source-is-authenticated?            boolean
|      +--rw supa-policy-source-is-trusted?                  boolean
+--rw supa-policy-target-detail-container
|  +--rw supa-policy-target-detail-list* [supa-policy-ID]
|      +--rw entity-class?                                    identityref
|      +--rw supa-policy-ID                                    string
|      +--rw supa-policy-name?                                  string
|      +--rw supa-policy-object-description?                  string

```

```

|      +--rw supa-has-policy-metadata-agg-ptr*          instance-identifier
|      +--rw supa-has-policy-target-detail-agg-ptr?     instance-identifier
|      +--rw supa-has-policy-target-detail-part-ptr?    instance-identifier
|      +--rw supa-policy-target-is-authenticated?       boolean
|      +--rw supa-policy-target-is-enabled?            boolean
+--rw supa-policy-clause-detail-container
|   +--rw supa-policy-clause-detail-list* [supa-policy-ID]
|       +--rw entity-class?                        identityref
|       +--rw supa-policy-ID                        string
|       +--rw supa-policy-name?                     string
|       +--rw supa-policy-object-description?        string
|       +--rw supa-has-policy-metadata-agg-ptr*      instance-identifier
|       +--rw supa-has-policy-clause-detail-agg-ptr* instance-identifier
|       +--rw supa-has-policy-clause-detail-part-ptr? instance-identifier
+--rw supa-policy-exec-fail-take-action-detail-container
|   +--rw supa-policy-exec-fail-take-action-detail-list* [supa-policy-ID]
|       +--rw entity-class?                        identityref
|       +--rw supa-policy-ID                        string
|       +--rw supa-policy-name?                     string
|       +--rw supa-policy-object-description?        string
|       +--rw supa-has-policy-metadata-agg-ptr*      instance-identifier
|       +--rw supa-has-exec-fail-action-detail-agg-ptr? instance-identifier
|       +--rw supa-has-exec-fail-action-detail-part-ptr? instance-identifier
|       +--rw supa-policy-exec-fail-take-action-name* string
+--rw supa-policy-metadata-decorator-detail-container
|   +--rw supa-policy-metadata-decorator-detail-list* [supa-policy-metadata-id]
|       +--rw entity-class?                        identityref
|       +--rw supa-policy-metadata-id                string
|       +--rw supa-policy-metadata-description?      string
|       +--rw supa-policy-metadata-name?             string
|       +--rw supa-has-policy-metadata-part-ptr*     instance-identifier
|       +--rw supa-has-policy-metadata-dec-part-ptr* instance-identifier
|       +--rw supa-has-policy-metadata-detail-dec-agg-ptr? instance-identifier
|       +--rw supa-has-policy-metadata-detail-dec-part-ptr? instance-identifier

```

## [5.](#) SUPA Policy Data Model YANG Module

The SUPA YANG data model module is divided into two main parts:

- 1) a set of containers that represent the objects that make up a Policy Rule and its Policy Rule Components
- 2) a set of containers that represent the objects that define and apply metadata to Policy Rules and/or Policy Rule Components

<CODE BEGINS> file "ietf-sup-a-policy@2017-06-16.yang"

```
module ietf-sup-a-policy {

    yang-version 1.1;
    namespace "urn:ietf:params:xml:ns:yang:ietf-sup-a-policy";
    prefix sup-a-pdm;

    import ietf-yang-types {
        prefix yang;
    }

    organization "IETF";
    contact
        "Editor: Joel Halpern
        email: jmh@joelhalpern.com;
        Editor: John Strassner
        email: strazpdj@gmail.com;";

    description
        "This module defines a data model for generic high level
        definition of policies to be applied to a network.
        This module is derived from, and aligns with,
        draft-ietf-sup-a-generic-policy-info-model-03. Details on all
        classes, associations, and attributes can be found there.
        Copyright (c) 2015 IETF Trust and the persons identified
        as the document authors. All rights reserved.
        Redistribution and use in source and binary forms, with or
        without modification, is permitted pursuant to, and
        subject to the license terms contained in, the Simplified
        BSD License set forth in Section 4.c of the IETF Trust's
        Legal Provisions Relating to IETF Documents
        (http://trustee.ietf.org/license-info).";

    revision "2017-06-16" {
        description
            "20170616: Implemented changes from sup-a IM v3. This
            includes adding new objects (classes and
            relationships) corresponding to the new
            formulation of the decorator pattern. Changed
            enums to identities per IETF98 discussion.
```

```

        reworted definitions of supaPolMetadataID and
        supaEncodedClauseEncoding attribute.
20170117: updated class and attribute names in the YANG
        to match those in the IM, except where noted.
20161210: Incorporated input from IISOMI.
20161010: Changed back to transitive identities (to
        enforce inheritance) after determining that
        errors were from a confdc bug.
20161008: Fixed errors found in latest pyang compiler
        and from YANG Doctors.
20161001: Minor edits in association definitions.
20160928: Generated yang tree.
20160924: Rewrote association documentation; rebuilt
        how all classes are named for consistency.
20160904: Optimization of module by eliminating leaves
        that are not needed; rewrote section 4.
20160824: Edits to sync data model to info model.
20160720: Conversion to WG draft. Fixed pyang 1.1
        compilation errors. Fixed must clause
        derefencing used in grouping statements.
        Reformatted and expanded descriptions.
        Fixed various typos.
20160321: Initial version.";
reference
    "draft-ietf-supa-policy-data-model-03";
}

```

```

// The following replaces enumerations with identities. This is because
// YANG enumerations are not extensible in sub-models. Therefore, we
// define a base identity for each enumerated list, and then derive an
// identity for each currently defined value in the enumeration. This
// enables new values to be added by models that extend this model.

```

```

identity POLICY-CONSTRAINT-LANGUAGE-LIST {
    description
        "The language used to encode the constraints that are
        relevant to the relationship between the metadata
        and the underlying policy object.";
}

identity PCLL-ERROR {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This signifies an error state for a policy constraint
        language assignment.";
}

```

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```
identity PCLL-INIT {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This signifies a generic initialization state, meaning
        that the policy constraint language assignment can now
        be made.";
}

identity PCLL-OCL2.4 {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This defines OCL2.4 [2] as the policy constraint language
        list to be used.";
}

identity PCLL-OCL2.x {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This defines the use of OCL2.0 - OCL2.3.1 [2] as the
        policy constraint language list to be used.";
}

identity PCLL-OCL1.x {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This defines OCL1.x [3] as the policy constraint language
        list to be used.";
}

identity PCLL-QVT1.2R {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This defines the use of QVT Relational Language [5] as the
        policy constraint language list to be used.";
}

identity PCLL-QVT1.2O {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This defines the use of QVT Operational Language [5] as
        the policy constraint language list to be used.";
}

identity PCLL-ALLOY {
```



```

    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This defines the use of Alloy [4] as the policy constraint
        language list to be used. Alloy is a language for
        defining constraints, and uses a SAT solver to
        guarantee correctness.";
}

```

```

identity PCLL-TEXT {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
    description
        "This defines the use of plain text as the policy constraint
        language list to be used. This option is NOT recommended,
        since it is informal and hence, not verifiable.";
}

identity POLICY-DATA-TYPE-ID-ENCODING-LIST {
    description
        "The list of possible data types used to represent object
        IDs for all SUPA object instances.";
}

identity PDTIEL-ERROR {
    base POLICY-DATA-TYPE-ID-ENCODING-LIST;
    description
        "This signifies an error state for a policy data type ID
        encoding assignment.";
}

identity PDTIEL-INIT {
    base POLICY-DATA-TYPE-ID-ENCODING-LIST;
    description
        "This signifies a generic initialization state, meaning
        that the policy data type ID encoding assignment can now
        be made.";
}

identity PDTIEL-PK {
    base POLICY-DATA-TYPE-ID-ENCODING-LIST;
    description
        "This represents the primary key of a table, which
        uniquely identifies each record in that table.
        It MUST NOT be NULL. It MAY consist of a single
        or multiple fields. Note that a YANG data model

```

```

        implementation does NOT have to implement this feature.";
    }

    identity PDTIEL-FK {
        base POLICY-DATA-TYPE-ID-ENCODING-LIST;
        description
            "This represents the foreign key of a table, which
            uniquely identifies each record in that table.
            It MUST NOT be NULL. It MAY consist of a single
            or multiple fields. Note that a YANG data model
            implementation does NOT have to implement this feature.";
    }

```

```

    identity PDTIEL-GUID {
        base POLICY-DATA-TYPE-ID-ENCODING-LIST;
        description
            "This represents an object instance that is referenced by
            this GUID.";
    }

    identity PDTIEL-UUID {
        base POLICY-DATA-TYPE-ID-ENCODING-LIST;
        description
            "This represents an object instance that is referenced by
            this UUID.";
    }

    identity PDTIEL-URI {
        base POLICY-DATA-TYPE-ID-ENCODING-LIST;
        description
            "This represents an object instance that is referenced by
            this URI.";
    }

    identity PDTIEL-FQDN {
        base POLICY-DATA-TYPE-ID-ENCODING-LIST;
        description
            "This represents an object instance that is referenced by
            this FQDN.";
    }

```

```

identity PDTEL-FQPN {
    base POLICY-DATA-TYPE-ID-ENCODING-LIST;
    description
        "This represents an object instance that is referenced by
        this FQPN. Note that FQPNs assume that all components can
        access a single logical file repository.";
}

identity PDTEL-STRING-ID {
    base POLICY-DATA-TYPE-ID-ENCODING-LIST;
    description
        "This represents an object instance that is referenced by
        this string instance id. Here, a string instance id is the
        canonical representation, in ASCII, of an instance ID of
        this object instance.";
}

identity POLICY-DATA-TYPE-ENCODING-LIST {
    description
        "The set of allowable data types used to encode single-
        and multi-valued SUPA Policy attributes.";
}

```

```

identity PDTEL-ERROR {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This signifies an error state for a policy data type
        encoding assignment.";
}

identity PDTEL-INIT {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This signifies a generic initialization state, meaning
        that the policy data type encoding assignment can now
        be made.";
}

identity PDTEL-STRING {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a string data type.";
}

```

```

identity PDTEL-INTEGER {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents an integer data type.";
}

identity PDTEL-BOOLEAN {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a Boolean data type.";
}

identity PDTEL-FLOAT {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a floating point data type.";
}

identity PDTEL-DATETIME {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a data type that can specify
        date and/or time.";
}

identity PDTEL-GUID {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a GUID data type.";
}

```

```

identity PDTEL-UUID {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a UUID data type.";
}

identity PDTEL-URI {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a URI data type.";
}

```

```

identity PDTEL-DN {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a DN data type.";
}

identity PDTEL-FQDN {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents an FQDN data type.";
}

identity PDTEL-FQPN {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents an FQPN data type. Note that FQPNs assume
        that all components can access a single logical
        file repository.";
}

identity PDTEL-NULL {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents a NULL data type. NULL means that this
        data type MAY not contain an actual value. This data type
        may be used to represent a missing or invalid value.";
}

identity PDTEL-STRING-ID {
    base POLICY-DATA-TYPE-ENCODING-LIST;
    description
        "This represents an object instance that is defined by
        this string instance id. Here, a string instance id is the
        canonical representation, in ASCII, of an instance ID of
        this object instance.";
}

```

```

identity POLICY-DEPLOY-STATUS-LIST {
    description
        "This represents the current deployment status of this
        object (e.g., either a SUPAPolicyStructure or a

```

```

        SUPAPolicyClause object instance).";
    }

    identity PDSL-ERROR {
        base POLICY-DEPLOY-STATUS-LIST;
        description
            "This signifies an error state for assigning the deployment
            status of this object.";
    }

    identity PDSL-INIT {
        base POLICY-DEPLOY-STATUS-LIST;
        description
            "This signifies a generic initialization state, meaning
            that the deploy status assignment of this object can now
            be made.";
    }

    identity PDSL-READY {
        base POLICY-DEPLOY-STATUS-LIST;
        description
            "This defines the deployment status of this object as
            deployed in the system and currently enabled.";
    }

    identity PDSL-TEST {
        base POLICY-DEPLOY-STATUS-LIST;
        description
            "This defines the deployment status of this object as
            deployed in the system but is currently in a test state,
            and SHOULD NOT be used in OAM&P policies.";
    }

    identity PDSL-DISABLED {
        base POLICY-DEPLOY-STATUS-LIST;
        description
            "This defines the deployment status of this object as
            deployed in the system, but has been administratively
            DISABLED. It MUST NOT be used in OAM&P policies.";
    }

    identity PDSL-OK-TO-DEPLOY {
        base POLICY-DEPLOY-STATUS-LIST;
        description
            "This defines the deployment status of this object as
            initialized and ready to be deployed.";
    }

```

```
identity PDSL-NOT-OK {
    base POLICY-DEPLOY-STATUS-LIST;
    description
        "This defines the deployment status of this object as
        NOT ready for deployment into the system.";
}

// Identities are used in this model as a means to provide simple
// introspection to allow an instance-identifier to be tested as to
// what class it represents. This allows must clauses to specify
// that the target of a particular instance-identifier leaf must be a
// specific class, or within a certain branch of the inheritance tree.
// This depends upon the ability to refine the entity class default
// value. The entity class should be read-only. However, as this is
// the target of a MUST condition, it cannot be config-false. Also,
// it appears that we cannot put a MUST condition on its definition,
// as the default (actual) value changes for each inherited object.
// Finally, note that since identities are irreflexive, we define a
// parent identity, called SUPA-ROOT-TYPE, to serve as the single root
// from which all identity statements are derived.

identity SUPA-ROOT-TYPE {
    description
        "The identity corresponding to a single root for all
        identities in the SUPA Data Model. Note that section
        7.18.2 in \[RFC7950\] says that identity derivation is
        irreflexive (i.e., an identity cannot be derived
        from itself.");
}

identity POLICY-OBJECT-TYPE {
    base SUPA-ROOT-TYPE;
    description
        "The identity corresponding to a SUPAPolicyObject
        object instance.";
}

grouping supa-policy-object-type {
    leaf entity-class {
        type identityref {
            base SUPA-ROOT-TYPE;
        }
        default POLICY-OBJECT-TYPE;
        description
            "The identifier of the class of this grouping.";
    }
    leaf supa-policy-ID {
        type string;
    }
}
```

mandatory true;  
description

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```
"The string identifier of this policy object, which
functions as the unique object identifier of this
object instance. This attribute MUST be unique within
the policy system.
This attribute is named supaPolObjIDContent in [1],
and is used with the supaPolObjIDEncoding class
attribute to define a namespace. Since the YANG data
model does not need this genericity, the
supaPolObjIDContent attribute was renamed, and the
supaObjectIDEncoding attribute was removed.";
}
leaf supa-policy-name {
    type string;
    description
        "A human-readable name for this policy object. Note
        that this is NOT the object ID.";
}
leaf supa-policy-object-description {
    type string;
    description
        "A human-readable description of the characteristics
        and behavior of this policy object.";
}
leaf-list supa-has-policy-metadata-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref())/entity-class,
        'SUPA-HAS-POLICY-METADATA-ASSOC'";
    description
        "This leaf-list holds instance-identifiers that
        reference a SUPAHasPolicyMetadata association [1].
        This association is represented by the grouping
        supa-has-policy-metadata-detail. This association
        describes how each SUPAPolicyMetadata instance is
        related to a given SUPAPolicyObject instance. Since
        this association class contains attributes, the
        instance-identifier MUST point to an instance using
        the grouping supa-has-policy-metadata-detail (which
        includes subclasses of this association class).";
}
description
```



"This represents the SUPAPolicyObject [\[1\]](#) class. It is the superclass for all SUPA Policy objects (i.e., all objects that are either Policies or components of Policies). Note that SUPA Policy Metadata objects are NOT subclassed from this class; they are instead subclassed from the SUPAPolicyMetadata (i.e., supa-policy-metadata-type) object. This class (supa-policy-object-type) is used to define common attributes and relationships that all SUPA Policy subclasses inherit.

It MAY be augmented with a set of zero or more SUPAPolicyMetadata objects using the SUPAHasPolicyMetadata association, which is represented by the supa-has-policy-metadata-agg leaf-list.";

}

```
identity POLICY-COMPONENT-TYPE {  
    base POLICY-OBJECT-TYPE;  
    description  
        "The identity corresponding to a  
        SUPAPolicyComponentStructure object instance."  
}
```

```
grouping supa-policy-component-structure-type {  
    uses supa-policy-object-type {  
        refine entity-class {  
            default POLICY-COMPONENT-TYPE;  
        }  
    }  
    description  
        "This represents the SUPAPolicyComponent class \[1\], which  
        is the superclass for all objects that represent  
        different components of a Policy. Important subclasses  
        include the SUPAPolicyClause and the  
        SUPAPolicyClauseComponentDecorator. SUPAPolicyClause is  
        used to build reusable clauses for SUPAPolicies, and  
        SUPAPolicyClauseComponentDecorator is used to dynamically  
        add and remove components of a SUPAPolicyClause. This  
        enables the model to be changed at runtime without  
        requiring recompiling and redeploying."  
}
```

```

identity POLICY-COMPONENT-CLAUSE-TYPE {
    base POLICY-COMPONENT-TYPE;
    description
        "The identity corresponding to a SUPAPolicyClause
        object instance.";
}

grouping supa-policy-clause-type {
    uses supa-policy-component-structure-type {
        refine entity-class {
            default POLICY-COMPONENT-CLAUSE-TYPE;
        }
    }
    leaf supa-policy-clause-deploy-status {
        type identityref {
            base POLICY-DEPLOY-STATUS-LIST;
        }
        mandatory true;
    }
}

```

```

    description
        "This defines whether this SUPAPolicy has been
        deployed and, if so, whether it is enabled and
        ready to be used or not.";
}
leaf-list supa-has-policy-clause-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref())/entity-class,
        'SUPA-HAS-POLICY-CLAUSE-ASSOC')";
    description
        "This leaf-list holds instance-identifiers that
        reference a SUPAHasPolicyClause aggregation [1],
        and is represented by the grouping
        supa-has-policy-clause-detail. This aggregation
        describes how each SUPAPolicyClause instance is
        related to this particular SUPAPolicyStructure
        instance. For example, this aggregation may restrict
        which concrete subclasses of the SUPAPolicyStructure
        class can be associated with which concrete subclasses
        of the SUPAPolicyClause class. The set of
        SUPAPolicyClauses, identified by this leaf-list,
        define the content of this SUPAPolicyStructure.
        Since this association class contains attributes, the
        instance-identifier MUST point to an instance using

```

```

        the grouping supa-has-policy-clause-detail (which
        includes subclasses of this association class).";
    }
    leaf-list supa-policy-clause-has-decorator-aggr-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref())/entity-class,
            'SUPA-POLICY-CLAUSE-HAS-DECORATOR-ASSOC'";
        description
            "This leaf-list holds instance-identifiers that
            reference a SUPAPolicyClauseHasDecorator aggregation
            [1], and is represented by the grouping
            supa-policy-clause-has-decorator-detail. This
            aggregation describes how each SUPAPolicyClause
            object instance is decorated (i.e., wrapped) by zero
            or more SUPAPolicyClauseComponentDecorator object
            instances. For example, this aggregation may restrict
            which concrete subclasses of the
            SUPAPolicyClauseComponentDecorator class can wrap
            this particular concrete subclass of the
            SUPAPolicyClause class. The set of SUPAPolicyClauses,
            identified by this leaf-list, define the content of
            this SUPAPolicyStructure that they are associated
            with (via the SUPAHasPolicyClause aggregation).

```

```

        Since this association class contains attributes, the
        instance-identifier MUST point to an instance using
        the grouping supa-policy-clause-has-decorator-detail
        (which includes subclasses of this association
        class). Note that (concrete) subclasses of this
        association class may also be used to further refine
        the semantics of this aggregation.";
    }
    description
        "The parent class for all SUPA Policy Clauses. A
        SUPAPolicyClause is a fundamental building block for
        creating SUPA Policies. A SUPAPolicy is a set of
        statements, and a SUPAPolicyClause can be thought of as all
        or part of a statement. The Decorator pattern [1] is used,
        which enables the contents of a SUPAPolicyClause to be
        adjusted dynamically at runtime without affecting other

```

```

        objects of either type. For example, new content can be
        dynamically added or removed by wrapping a SUPAPolicyClause
        with additional object instances. Every SUPAPolicy MUST
        have at least one SUPAPolicyClause.";
    }

    identity POLICY-CLAUSE-COMPONENT-DECORATOR-TYPE {
        base POLICY-COMPONENT-TYPE;
        description
            "The identity corresponding to a
            SUPAPolicyClauseComponentDecorator object instance.";
    }

    grouping supa-policy-clause-component-decorator-type {
        uses supa-policy-component-structure-type {
            refine entity-class {
                default POLICY-CLAUSE-COMPONENT-DECORATOR-TYPE;
            }
        }
        leaf-list supa-policy-clause-has-decorator-part-ptr {
            type instance-identifier;
            must "derived-from-or-self (deref())/entity-class,
                'SUPA-POLICY-CLAUSE-HAS-DECORATOR-ASSOC'";
            description
                "This leaf holds instance-identifiers that
                reference a SUPAPolicyClauseHasDecorator aggregation,
                [1], and is represented by the grouping
                supa-policy-clause-has-decorator-detail. This
                aggregation describes how each
                SUPAPolicyClauseComponentDecorator object instance
                wraps a given SUPAPolicyClause object instance. This
                enables the behavior of a SUPAPolicyClause object
                instance to be changed dynamically by attaching and/or
                removing SUPAPolicyClauseComponentDecorator object
                instances."
        }
    }

```

Multiple SUPAPolicyClauseComponentDecorator object instances may be attached to a SUPAPolicyClause object instance that is referenced in this aggregation by using the Decorator pattern [[1](#)]. Since this association class contains attributes, the instance-identifier MUST point to an instance using the grouping supa-policy-clause-has-decorator-detail. Note that (concrete) subclasses of this association

```

        class may also be used to further refine the semantics
        of this aggregation.";
    }
    leaf supa-has-decorated-policy-component-part-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref())/entity-class,
            'SUPA-HAS-DECORATED-POLICY-COMPONENT-ASSOC'";
        description
            "This leaf holds instance-identifiers that
            reference a SUPAHasDecoratedPolicyComponent
            aggregation [1], and is represented by the grouping
            supa-has-decorated-policy-component-detail. This
            aggregation describes how each
            SUPAPolicyClauseComponentDecorator instance is wrapped
            by a given SUPAPolicyComponentDecorator instance.
            Multiple SUPAPolicyComponentDecorator instances may be
            attached to a SUPAPolicyClauseComponentDecorator
            instance that is referenced in this aggregation by
            using the Decorator pattern [1]. Since this
            association class contains attributes, the
            instance-identifier MUST point to an instance using
            the grouping
            supa-has-decorated-policy-component-detail.";
    }
    leaf-list supa-pol-clause-constraint {
        type string;
        description
            "This is a set of constraint expressions that are
            applied to this decorator object instance. These
            constraints restrict the semantics of this object
            instance, and hence, restrict how these objects
            interact with the SUPAPolicyClause object instance
            that is aggregating them. For example, this attribute
            could restrict how a concrete subclass, such as
            SUPAPolicyEvent, is used. The constraints are defined
            using an appropriate constraint language that is
            specified in the supa-pol-clause-constraint-encoding
            leaf.";
    }
    leaf supa-pol-clause-constraint-encoding {
        type identityref {
            base POLICY-CONSTRAINT-LANGUAGE-LIST;
        }
    }

```

```

        description
            "The language in which the constraints on the
              SUPAPolicyClauseComponentDecorator is expressed.
              Examples include OCL 2.4 [2], Alloy [3], and
              English text.";
    }
    description
        "This object implements the Decorator pattern [1], which
          enables all or part of one or more concrete objects to
          wrap another concrete object. The set of decorated
          objects is then wrapped by a concrete subclass of the
          SUPAPolicyClause object, which enables the
          SUPAPolicyClause object to be changed dynamically at
          runtime without recompilation or redeployment.";
    }

identity POLICY-COMPONENT-DECORATOR-TYPE {
    base POLICY-CLAUSE-COMPONENT-DECORATOR-TYPE;
    description
        "The identity corresponding to a
          SUPAPolicyComponentDecorator object instance.";
}

grouping supa-policy-component-decorator-type {
    uses supa-policy-clause-component-decorator-type {
        refine entity-class {
            default POLICY-COMPONENT-DECORATOR-TYPE;
        }
    }
}

leaf-list supa-has-decorated-policy-component-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
        'SUPA-HAS-DECORATED-POLICY-COMPONENT-ASSOC'))";
    description
        "This leaf holds instance-identifiers that
          reference a SUPAHasDecoratedPolicyComponent
          aggregation [1], and is represented by the grouping
          supa-has-decorated-policy-component-detail. This
          aggregation describes how each
          SUPAPolicyComponentDecorator instance wraps a given
          SUPAPolicyClauseComponentDecorator instance.
          Multiple SUPAPolicyComponentDecorator instances may be
          attached to a SUPAPolicyClauseComponentDecorator
          instance that is referenced in this aggregation by
          using the Decorator pattern [1]. Since this
          association class contains attributes, the
          instance-identifier MUST point to an instance using
          the grouping
          supa-has-decorated-policy-component-detail.";
}

```

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```
leaf-list supa-pol-comp-constraint {
  type string;
  description
    "This is a set of constraint expressions that are
    applied to this decorator object instance. These
    constraints restrict the semantics of this object
    instance, and hence, restrict how these objects
    interact with the SUPAPolicyClauseComponentDecorator
    object instance that they are wrapping. For example,
    this attribute could restrict how a concrete subclass
    of SUPAPolicyComponentDecorator is used. The
    constraints are defined using an appropriate constraint
    language that is specified in the
    supa-pol-comp-constraint-encoding leaf.";
}
leaf supa-pol-comp-constraint-encoding {
  type identityref {
    base POLICY-CONSTRAINT-LANGUAGE-LIST;
  }
  description
    "The language in which constraints on the
    SUPAPolicyComponentDecorator is expressed.
    Examples include OCL 2.4 [2], Alloy [3], and
    English text.";
}
description
  "This object implements the Decorator pattern [1], which
  enables all or part of one or more concrete objects of
  the SUPAPolicyClauseComponentDecorator class to create a
  set of wrapped objects that are in turn aggregated by a
  SUPAPolicyClause object. This enables the SUPAPolicyClause
  object to be changed dynamically at runtime without
  recompilation or redeployment.";
}

identity POLICY-ENCODED-CLAUSE-TYPE {
  base POLICY-COMPONENT-CLAUSE-TYPE;
  description
    "The identity corresponding to a SUPAEncodedClause
    object instance.";
}
```

```

grouping supa-encoded-clause-type {
  uses supa-policy-clause-type {
    refine entity-class {
      default POLICY-ENCODED-CLAUSE-TYPE;
    }
  }
}

```

```

leaf supa-encoded-clause-content {
  type string;
  mandatory true;
  description
    "This defines the content of this SUPAEncodedClause.
    Since the target is YANG, the supaEncodedClauseEncoding
    attribute is NOT required, and therefore, not mapped.";
}
leaf supa-encoded-clause-language {
  type enumeration {
    enum "error" {
      description
        "This signifies an error state. OAM&P Policies
        SHOULD NOT use this SUPAEncodedClause if the
        value of this attribute is error.";
    }
    enum "init" {
      description
        "This signifies an initialization state.";
    }
    enum "YANG" {
      description
        "This defines the language used in this
        SUPAEncodedClause as a type of YANG.
        Additional details may be provided by
        attaching a SUPAPolicyMetadata object to
        this SUPAEncodedClause object instance.";
    }
    enum "XML" {
      description
        "This defines the language as a type of XML.
        Additional details may be provided by
        attaching a SUPAPolicyMetadata object to
        this SUPAEncodedClause object instance.";
    }
  }
}

```



```

enum "TL1" {
    description
        "This defines the language as a type of
        Transaction Language 1. Additional details may
        be provided by attaching a SUPAPolicyMetadata
        object to this SUPAEncodedClause object
        instance.";
}
enum "Text" {
    description
        "This is a textual string that can be used to
        define a language choice that is not listed
        by a specific enumerated value. This string
        MUST be parsed by the policy system to
        identify the language being used.

```

```

        A SUPAPolicyMetadata object (represented as a
        supa-policy-metadata-type leaf) can be used to
        provide further details about the language";
    }
}
mandatory true;
description
    "Indicates the language used for this SUPAEncodedClause
    object instance. Prescriptive and/or descriptive
    information about the usage of this SUPAEncodedClause
    may be provided by one or more SUPAPolicyMetadata
    objects, which are each attached to the object
    instance of this SUPAEncodedClause.";
}
description
    "This class refines the behavior of the supa-policy-clause
    by encoding the contents of the clause into the attributes
    of this object. This enables clauses that are not based on
    other SUPA objects to be modeled. For example, a POLICY
    Application could define a CLI or YANG configuration
    snippet and encode that snippet into a SUPAEncodedClause.
    Note that a SUPAEncodedClause simply defines the content
    of the clause. In particular, it does NOT provide a
    response. The policy engine that is parsing and evaluating
    the SUPAPolicy needs to assign a response to any
    SUPAEncodedClause that it encounters.";
}

```

```

container supa-encoding-clause-container {
    description
        "This is a container to collect all object instances of
        type SUPAEncodedClause.";

    list supa-encoding-clause-list {
        key supa-policy-ID;
        uses supa-encoded-clause-type;
        description
            "A list of all instances of supa-encoding-clause-type.
            If a module defines subclasses of the encoding clause,
            those will be stored in a separate container.";
    }
}

identity POLICY-COMPONENT-TERM-TYPE {
    base POLICY-COMPONENT-DECORATOR-TYPE;
    description
        "The identity corresponding to a SUPAPolicyTerm object
        instance.";
}

```

```

grouping supa-policy-term-type {
    uses supa-policy-component-decorator-type {
        refine entity-class {
            default POLICY-COMPONENT-TERM-TYPE;
        }
    }
    leaf supa-policy-term-is-negated {
        type boolean;
        description
            "If the value of this attribute is true, then
            this particular term is negated.";
    }
    description
        "This is the superclass of all SUPA policy objects that are
        used to test or set the value of a variable. It does this
        by defining a {variable-operator-value} three-tuple, where
        each element of the three-tuple is defined by a concrete
        subclass of the appropriate type (e.g., SUPAPolicyVariable,
        SUPAPolicyOperator, or SUPAPolicyVariable).";
}

```

```

}

identity POLICY-COMPONENT-VARIABLE-TYPE {
    base POLICY-COMPONENT-TERM-TYPE;
    description
        "The identity corresponding to a SUPAPolicyVariable
        object instance.";
}

grouping supa-policy-variable-type {
    uses supa-policy-term-type {
        refine entity-class {
            default POLICY-COMPONENT-VARIABLE-TYPE;
        }
    }
}

leaf supa-policy-variable-name {
    type string;
    description
        "A human-readable name for this policy variable.";
}
description
    "This is one formulation of a SUPA Policy Clause. It uses
    the canonical form of an expression, which is a three-tuple
    in the form {variable, operator, value}. In this approach,
    each of the three terms can either be a subclass of the
    appropriate SUPAPolicyTerm class, or another object that
    plays the role (i.e., a variable) of that term. The
    attribute defined by the supa-policy-variable-name
    specifies the name of an attribute whose content should be
    compared to the value portion of a SUPAPolicyTerm, which is
    typically specified by a SUPAPolicyValue object.";
}

```

```

container supa-policy-variable-container {
    description
        "This is a container to collect all object instances of
        type SUPAPolicyVariable.";
    list supa-policy-variable-list {
        key supa-policy-ID;
        uses supa-policy-variable-type;
        description
            "List of all instances of supa-policy-variable-type.
            If a module defines subclasses of this class,

```

```

        those will be stored in a separate container.";
    }
}

identity POLICY-COMPONENT-OPERATOR-TYPE {
    base POLICY-COMPONENT-TERM-TYPE;
    description
        "The identity corresponding to a SUPAPolicyOperator
        object instance.";
}

grouping supa-policy-operator-type {
    uses supa-policy-term-type {
        refine entity-class {
            default POLICY-COMPONENT-OPERATOR-TYPE;
        }
    }
    leaf supa-policy-value-op-type {
        type enumeration {
            enum "error" {
                description
                    "This signifies an error state.";
            }
            enum "init" {
                description
                    "This signifies an initialization state.";
            }
            enum "greater than" {
                description
                    "A greater-than operator.";
            }
            enum "greater than or equal to" {
                description
                    "A greater-than-or-equal-to operator.";
            }
            enum "less than" {
                description
                    "A less-than operator.";
            }
        }
    }
}

```

```

enum "less than or equal to" {
    description
        "A less-than-or-equal-to operator.";
}

```

```

    }
    enum "equal to" {
        description
            "An equal-to operator.";
    }
    enum "not equal to"{
        description
            "A not-equal-to operator.";
    }
    enum "IN" {
        description
            "An operator that determines whether a given
            value of a variable in a SUPAPolicyTerm
            matches a value in a SUPAPolicyTerm.";
    }
    enum "NOT IN" {
        description
            "An operator that determines whether a given
            variable in a SUPAPolicyTerm does not match
            any of the specified values in a
            SUPAPolicyTerm.";
    }
    enum "SET" {
        description
            "An operator that makes the value of the
            result equal to the input value.";
    }
    enum "CLEAR"{
        description
            "An operator that sets the value of the
            specified object to a value that is 0 for
            integer datatypes, an empty string for
            textual datatypes, and FALSE for Boolean
            datatypes. This value MUST NOT be NULL.";
    }
    enum "BETWEEN" {
        description
            "An operator that determines whether a given
            value is within a specified range of values.
            Note that this is an inclusive operator.";
    }
}
mandatory true;
description
    "The type of operator used to compare the variable
    and value portions of this SUPAPolicyTerm.";
}

```

```
description
  "This is one formulation of a SUPA Policy Clause. It uses
  the canonical form of an expression, which is a three-tuple
  in the form {variable, operator, value}. In this approach,
  each of the three terms can either be a subclass of the
  appropriate SUPAPolicyTerm class, or another object that
  plays the role (i.e., an operator) of that term.
  The value of the supa-policy-value-op-type attribute
  specifies an operator that SHOULD be used to compare the
  variable and value portions of a SUPAPolicyTerm. This is
  typically specified by a SUPAPolicyOperator object.";
}

container supa-policy-operator-container {
  description
    "This is a container to collect all object instances of
    type SUPAPolicyOperator.";
  list supa-policy-operator-list {
    key supa-policy-ID;
    uses supa-policy-operator-type;
    description
      "List of all instances of supa-policy-operator-type.
      If a module defines subclasses of this class,
      those will be stored in a separate container.";
  }
}

identity POLICY-COMPONENT-VALUE-TYPE {
  base POLICY-COMPONENT-TERM-TYPE;
  description
    "The identity corresponding to a SUPAPolicyValue
    object instance.";
}

grouping supa-policy-value-type {
  uses supa-policy-term-type {
    refine entity-class {
      default POLICY-COMPONENT-VALUE-TYPE;
    }
  }
  leaf-list supa-policy-value-content {
    type string;
    description
      "The content of the value portion of this SUPA Policy
      Clause. The data type of the content is specified in
      the supa-policy-value-encoding attribute.";
  }
}
```

}

```
    leaf supa-policy-value-encoding {
      type identityref {
        base POLICY-DATA-TYPE-ENCODING-LIST;
      }
      description
        "The data type of the supa-policy-value-content
        attribute.";
    }
  description
    "This is one formulation of a SUPA Policy Clause. It uses
    the canonical form of an expression, which is a three-tuple
    in the form {variable, operator, value}. In this approach,
    each of the three terms can either be a subclass of the
    appropriate SUPAPolicyTerm class, or another object that
    plays the role (i.e., a value) of that term. The
    attribute defined by supa-policy-value-content specifies a
    a value (which is typically specified by a subclass of
    SUPAPolicyVariable) that should be compared to a value in
    the variable portion of the SUPAPolicyTerm.";
}

container supa-policy-value-container {
  description
    "This is a container to collect all object instances of
    type SUPAPolicyValue.";
  list supa-policy-value-list {
    key supa-policy-ID;
    uses supa-policy-value-type;
    description
      "List of all instances of supa-policy-value-type.
      If a module defines subclasses of this class,
      those will be stored in a separate container.";
  }
}

identity POLICY-GENERIC-DECORATED-TYPE {
  base POLICY-COMPONENT-DECORATOR-TYPE;
  description
```

```

        "The identity corresponding to a
        SUPAGenericDecoratedComponent object instance.";
    }
    grouping supa-policy-generic-decorated-type {
        uses supa-policy-component-decorator-type {
            refine entity-class {
                default POLICY-GENERIC-DECORATED-TYPE;
            }
        }
    }
    leaf-list supa-policy-generic-decorated-content {
        type string;
        description

```

```

        "The content of this SUPAGenericDecoratedComponent
        object instance. The data type of this attribute is
        specified in the leaf
        supa-policy-generic-decorated-encoding.";
    }
    leaf supa-policy-generic-decorated-encoding {
        type identityref {
            base POLICY-DATA-TYPE-ENCODING-LIST;
        }
        description
            "The datatype of the
            supa-policy-generic-decorated-content attribute.";
    }
    description
        "This class enables a generic object to be defined and
        used as a decorator in a SUPA Policy Clause. This class
        should not be confused with the SUPAEncodedClause class.
        A SUPAGenericDecoratedComponent object represents a single,
        atomic object that defines a portion of the contents of a
        SUPAPolicyClause, whereas a SUPAPolicyEncodedClause
        represents the entire contents of a SUPAPolicyClause.";
}

container supa-policy-generic-decorated-container {
    description
        "This is a container to collect all object instances of
        type SUPAGenericDecoratedComponent.";
    list supa-encoding-clause-list {
        key supa-policy-ID;
        uses supa-policy-generic-decorated-type;
        description

```



```

        "List of all instances of
        supa-policy-generic-decorated-type. If a module
        defines subclasses of this class, those will be
        stored in a separate container.";
    }
}

identity POLICY-STRUCTURE-TYPE {
    base POLICY-OBJECT-TYPE;
    description
        "The identity corresponding to a SUPAPolicyStructure
        object instance.";
}

grouping supa-policy-structure-type {
    uses supa-policy-object-type {
        refine entity-class {
            default POLICY-STRUCTURE-TYPE;
        }
    }
}

```

```

leaf supa-policy-admin-status {
    type enumeration {
        enum "error" {
            description
                "This signifies an error state. OAM&P Policies
                SHOULD NOT use this SUPAPolicy if the value
                of this attribute is error.";
        }
        enum "init" {
            description
                "This signifies an initialization state.";
        }
        enum "enabled" {
            description
                "This signifies that this SUPAPolicy has been
                administratively enabled.";
        }
        enum "disabled" {
            description
                "This signifies that this SUPAPolicy has been
                administratively disabled.";
        }
        enum "in test" {

```

```

        description
            "This signifies that this SUPAPolicy has been
            administratively placed into test mode, and
            SHOULD NOT be used as part of an operational
            policy rule.";
    }
}
mandatory true;
description
    "The current administrative status of this SUPAPolicy.";
}
leaf supa-policy-continuum-level {
    type uint32;
    description
        "This is the current level of abstraction of this
        particular SUPAPolicyRule. By convention, the
        values 0 and 1 should be used for error and
        initialization states; a value of 2 is the most
        abstract level, and higher values denote more
        concrete levels.";
}
leaf supa-policy-deploy-status {
    type enumeration {
        enum "error" {
            description
                "This signifies an error state.";
        }
    }
}

```

```

enum "init" {
    description
        "This signifies an initialization state.";
}
enum "deployed and enabled" {
    description
        "This SUPAPolicy has been deployed in the
        system and is currently enabled.";
}
enum "deployed and in test" {
    description
        "This SUPAPolicy has been deployed in the
        system, but is currently in test and SHOULD
        NOT be used in OAM&P policies.";
}
}

```

```

        enum "deployed but not enabled" {
            description
                "This SUPAPolicy has been deployed in the
                system, but has been administratively
                disabled.";
        }
        enum "ready to be deployed" {
            description
                "This SUPAPolicy has been properly initialized,
                and is now ready to be deployed.";
        }
        enum "cannot be deployed" {
            description
                "This SUPAPolicy has been administratively
                disabled, and SHOULD NOT be used as part of
                an OAM&P policy.";
        }
    }
    mandatory true;
    description
        "This attribute defines whether this SUPAPolicy has
        been deployed and, if so, whether it is enabled and
        ready to be used or not.";
}
leaf supa-policy-exec-fail-strategy {
    type enumeration {
        enum "error" {
            description
                "This signifies an error state.";
        }
        enum "init" {
            description
                "This signifies an initialization state.";
        }
    }
}

```

```

enum "rollback all" {
    description
        "This means that execution of this SUPAPolicy
        SHOULD be stopped, and rollback of all
        SUPAPolicyActions (whether they were
        successfully executed or not) performed by
        this particular SUPAPolicy is attempted. Also,

```

```

        all SUPAPolicies that otherwise would have
        been executed as a result of this SUPAPolicy
        SHOULD NOT be executed.";
    }
    enum "rollback single" {
        description
            "This means that execution of this SUPAPolicy
            SHOULD be stopped, and rollback is attempted
            for ONLY the SUPAPolicyAction (belonging to
            this particular SUPAPolicy) that failed to
            execute correctly. All remaining actions
            including SUPAPolicyActions and SUPAPolicies
            that otherwise would have been executed as a
            result of this SUPAPolicy, SHOULD NOT
            be executed.";
    }
    enum "stop execution" {
        description
            "This means that execution of this SUPAPolicy
            SHOULD be stopped without any other action
            being performed; this includes corrective
            actions, such as rollback, as well as any
            SUPAPolicyActions or SUPAPolicies that
            otherwise would have been executed.";
    }
    enum "ignore" {
        description
            "This means that any failures produced by this
            SUPAPolicy SHOULD be ignored, and hence, no
            corrective actions, such as rollback, will
            be performed at this time. Hence, any other
            SUPAPolicyActions or SUPAPolicies SHOULD
            continue to be executed.";
    }
}
mandatory true;
description
    "This defines what actions, if any, should be taken by
    this particular SUPA Policy Rule if it fails to
    execute correctly. Some implementations may not be
    able to accommodate the rollback failure options;
    hence, these options may be skipped.";
}

```

```

leaf-list supa-has-policy-source-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
        'SUPA-HAS-POLICY-SOURCE-ASSOC'))";
    description
        "This leaf-list holds instance-identifiers that
        reference SUPAHasPolicySource associations [1].
        This association is represented by the grouping
        supa-has-policy-source-detail, and describes how
        this SUPAPolicyStructure instance is related to a
        set of SUPAPolicySource instances. Each
        SUPAPolicySource instance defines a set of
        unambiguous sources of this SUPAPolicy. Since
        this association class contains attributes, the
        instance-identifier MUST point to an instance using
        the grouping supa-has-policy-source-detail (which
        includes subclasses of this association class).";
}
leaf-list supa-has-policy-target-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
        'SUPA-HAS-POLICY-TARGET-ASSOC'))";
    description
        "This leaf-list holds instance-identifiers that
        reference SUPAHasPolicyTarget associations [1].
        This association is represented by the grouping
        supa-has-policy-target-detail, and describes how
        this SUPAPolicyStructure instance is related to a
        set of SUPAPolicyTarget instances.
        Each SUPAPolicyTarget instance defines a set of
        unambiguous managed entities to which this
        SUPAPolicy will be applied to. Since this association
        class contains attributes, the instance-identifier
        MUST point to an instance using the grouping
        supa-has-policy-target-detail (which includes
        subclasses of this association class).";
}
leaf-list supa-has-policy-clause-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
        'SUPA-HAS-POLICY-CLAUSE-ASSOC'))";
    description
        "This leaf-list holds instance-identifiers that
        reference SUPAHasPolicyClause associations [1]. This
        association is represented by the grouping
        supa-has-policy-clause-detail. This association
        describes how this particular SUPAPolicyStructure
        instance is related to this set of SUPAPolicyClause

```

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```
instances. Since this association class contains
attributes, the instance-identifier MUST point to an
instance using the supa-has-policy-clause-detail
(which includes subclasses of this association
class).";
}
leaf-list supa-has-policy-exec-fail-action-aggr-ptr {
  type instance-identifier;
  must "derived-from-or-self (deref())/entity-class,
    'SUPA-HAS-POLICY-EXEC-ACTION-ASSOC'";
  description
    "This leaf-list holds instance-identifiers that
    reference a SUPAHasPolExecFailActionToTake
    association [1]. This association is represented by
    the supa-has-policy-exec-action-detail grouping. This
    association relates this SUPAPolicyStructure instance
    (the parent) to one or more SUPAPolicyStructure
    instances (the children), where each child
    SUPAPolicyStructure contains one or more
    SUPAPolicyActions to be executed if the parent
    SUPAPolicyStructure instance generates an error while
    it is executing. Since this association class contains
    attributes, the instance-identifier MUST point to an
    instance using the grouping
    supa-has-policy-exec-action-detail (which includes
    subclasses of this association class).";
}
leaf-list supa-has-policy-exec-fail-action-part-ptr {
  type instance-identifier;
  must "derived-from-or-self (deref())/entity-class,
    'SUPA-HAS-POLICY-EXEC-ACTION-ASSOC'";
  min-elements 1;
  description
    "This leaf-list holds instance-identifiers that
    reference a SUPAHasPolExecFailActionToTake
    association [1]. This association is represented by
    the supa-has-policy-exec-action-detail grouping. This
    association relates this SUPAPolicyStructure instance
    (the child) to another SUPAPolicyStructure instance
    (the parent). The child SUPAPolicyStructure contains
    one or more SUPAPolicyActions to be executed if the
    parent SUPAPolicyStructure instance generates an error
```

```

        while it is executing; the parent SUPAPolicyStructure
        contains one or more child SUPAPolicyStructure
        instances to enable it to choose how to handle each
        type of failure. Since this association class contains
        attributes, the instance-identifier MUST point to an
        instance using the grouping
        supa-has-policy-exec-action-detail (which includes
        subclasses of this association class).";
    }

```

```

    description
        "A superclass for all objects that represent different types
        of SUPAPolicies. Currently, this is limited to a single
        type, which is the event-condition-action (ECA) Policy
        Rule. A SUPA Policy may be an individual policy, or a set
        of policies. Subclasses MAY support this feature by
        implementing the composite pattern.";
}

identity POLICY-SOURCE-TYPE {
    base POLICY-OBJECT-TYPE;
    description
        "The identity corresponding to a SUPAPolicySource
        object instance.";
}

grouping supa-policy-source-type {
    uses supa-policy-object-type {
        refine entity-class {
            default POLICY-SOURCE-TYPE;
        }
    }
}

leaf-list supa-has-policy-source-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref())/entity-class,
        'SUPA-HAS-POLICY-SOURCE-ASSOC'";
    description
        "This leaf-list holds the instance-identifiers that
        reference a SUPAHasPolicySource association [1], which
        is represented by the supa-has-policy-source-detail
        grouping. This association describes how each
        SUPAPolicySource instance is related to this
        particular SUPAPolicyStructure instance.
        Since this association class contains attributes, the

```

```

        instance-identifier MUST point to an instance using
        the grouping supa-has-policy-source-detail (which
        includes subclasses of this association class).";
    }
    description
        "This object defines a set of managed entities that
        authored, or are otherwise responsible for, this
        SUPAPolicy. Note that a SUPAPolicySource does NOT evaluate
        or execute SUPAPolicies. Its primary use is for
        auditability and the implementation of deontic logic (i.e.,
        how concepts such as obligation and permission work) and/or
        alethic logic (i.e., how concepts such as necessity,
        possibility, and contingency work). It is expected that this
        grouping will be extended (i.e., subclassed) when used, so
        that the system can add specific information appropriate to
        sources of policy of that particular system.";
}

```

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```

    container supa-policy-source-container {
        description
            "This is a container to collect all object instances of
            type SUPAPolicySource.";
        list supa-policy-source-list {
            key supa-policy-ID;
            uses supa-policy-source-type;
            description
                "A list of all supa-policy-source instances in the
                system.";
        }
    }

    identity POLICY-TARGET-TYPE {
        base POLICY-OBJECT-TYPE;
        description
            "The identity corresponding to a SUPAPolicyTarget
            object instance.";
    }

    grouping supa-policy-target-type {
        uses supa-policy-object-type {
            refine entity-class {
                default POLICY-TARGET-TYPE;
            }
        }
    }

```



```

}
leaf-list supa-has-policy-target-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
        'SUPA-HAS-POLICY-TARGET-ASSOC'))";
    description
        "This leaf-list holds instance-identifiers that
        reference a SUPAHasPolicyTarget association. This is
        represented by the supa-has-policy-target-detail
        grouping. This association describes how each
        SUPAPolicyTarget instance is related to a particular
        SUPAPolicyStructure instance. For example, this
        association may restrict which SUPAPolicyTarget
        instances can be used by which SUPAPolicyStructure
        instances. The SUPAPolicyTarget defines a
        set of managed entities that this SUPAPolicyStructure
        will be applied to. Since this association class
        contains attributes, the instance-identifier MUST
        point to an instance using the grouping
        supa-has-policy-target-detail (which
        includes subclasses of this association class).";
}

```

```

    description
        "This object defines a set of managed entities that a
        SUPAPolicy is applied to. It is expected that this
        grouping will be extended (i.e., subclassed) when used,
        so that the system can add specific information
        appropriate to policy targets of that particular system.";
}

container supa-policy-target-container {
    description
        "This is a container to collect all object instances of
        type SUPAPolicyTarget.";
    list supa-policy-target-list {
        key supa-policy-ID;
        uses supa-policy-target-type;
        description
            "A list of all supa-policy-target instances in the
            system.";
    }
}

```

```

    }
}

identity POLICY-METADATA-TYPE {
    base SUPA-ROOT-TYPE;
    description
        "The identity corresponding to a SUPAPolicyMetadata
        object instance.";
}

grouping supa-policy-metadata-type {
    leaf entity-class {
        type identityref {
            base SUPA-ROOT-TYPE;
        }
        description
            "The identifier of the class of this grouping.";
    }
    leaf supa-policy-metadata-id {
        type string;
        mandatory true;
        description
            "This represents the object identifier of an instance
            of this class. This attribute is named
            supaPolMetadataIDContent in [1], and is used with
            another attribute (supaPolMetadataIDEncoding); since
            the YANG data model does not need this genericity, the
            supaPolMetadataIDContent attribute was renamed to
            supa-policy-metadata-id, and the
            supaPolMetadataIDEncoding attribute was not mapped.";
    }
    leaf supa-policy-metadata-description {
        type string;
    }
}

```

```

        description
            "This contains a free-form textual description of this
            metadata object (e.g., what it may be used for).";
    }
    leaf supa-policy-metadata-name {
        type string;
        description
            "This contains a human-readable name for this
            metadata object.";
    }
}

```

```

leaf-list supa-has-policy-metadata-part-ptr {
  type instance-identifier;
  must "derived-from-or-self (deref())/entity-class,
    'SUPA-HAS-POLICY-METADATA-ASSOC'";
  description
    "This leaf-list holds instance-identifiers that
    reference a SUPAHasPolicyMetadata association [1],
    which is represented by the grouping
    supa-has-policy-metadata-detail. Each instance-
    identifier defines a unique set of information that
    describe and/or prescribe additional information,
    provided by this SUPAPolicyMetadata instance, that can
    be associated with this SUPAPolicyObject instance.
    Multiple SUPAPolicyMetadata objects may be attached to
    a concrete subclass of the SUPAPolicyObject class that
    is referenced in this association by using the
    Decorator pattern [1]. For example, a
    SUPAPolicyVersionMetadataDef instance could wrap a
    SUPAECAPolicyRuleAtomic instance; this would define
    the version of this particular SUPAECAPolicyRuleAtomic
    instance. Since this association class contains
    attributes, the instance-identifier MUST point to an
    instance using the grouping
    supa-has-policy-metadata-detail (which includes
    subclasses of this association class).";
}
leaf-list supa-has-policy-metadata-dec-part-ptr {
  type instance-identifier;
  must "derived-from-or-self (deref())/entity-class,
    'SUPA-HAS-POLICY-METADATA-DECORATOR-DETAIL-ASSOC'";
  min-elements 1;
  description
    "This leaf-list holds instance-identifiers that
    reference a SUPAHasMetadaDecorator association [1].
    This association is represented by the grouping
    supa-has-policy-metadata-dec-detail. This association
    describes how a SUPAPolicyMetadataDecorator instance
    wraps a given SUPAPolicyMetadata instance using the
    Decorator pattern [1]. Multiple concrete subclasses
    of SUPAPolicyMetadataDecorator may be used to wrap
    the same SUPAPolicyMetadata instance.

```

```

        the grouping supa-has-policy-metadata-dec-detail (which
        includes subclasses of this association class).";
    }
    description
        "This is the superclass of all metadata classes. Metadata
        is information that describes and/or prescribes the
        characteristics and behavior of another object that is
        not an inherent, distinguishing characteristics or
        behavior of that object.";
}

identity POLICY-METADATA-CONCRETE-TYPE {
    base POLICY-METADATA-TYPE;
    description
        "The identity corresponding to a SUPAPolicyConcreteMetadata
        object instance.";
}

grouping supa-policy-concrete-metadata-type {
    uses supa-policy-metadata-type {
        refine entity-class {
            default POLICY-METADATA-CONCRETE-TYPE;
        }
    }
    leaf supa-policy-metadata-valid-period-end {
        type yang:date-and-time;
        description
            "This defines the ending date and time that this
            metadata object is valid for.";
    }
    leaf supa-policy-metadata-valid-period-start {
        type yang:date-and-time;
        description
            "This defines the starting date and time that this
            metadata object is valid for.";
    }
    description
        "This is a concrete class that will be wrapped by concrete
        instances of the SUPA Policy Metadata Decorator class. It
        can be viewed as a container for metadata that will be
        attached to a subclass of SUPA Policy Object. It may
        contain all or part of one or more metadata subclasses.";
}

```

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```
container supa-policy-concrete-metadata-container {
  description
    "This is a container to collect all object instances of
    type SUPAPolicyConcreteMetadata.";
  list supa-policy-concrete-metadata-list {
    key supa-policy-metadata-id;
    uses supa-policy-concrete-metadata-type;
    description
      "A list of all supa-policy-metadata instances in the
      system.";
  }
}

identity POLICY-METADATA-DECORATOR-TYPE {
  base POLICY-METADATA-TYPE;
  description
    "The identity corresponding to a
    SUPAPolicyMetadataDecorator object instance.";
}

grouping supa-policy-metadata-decorator-type {
  uses supa-policy-metadata-type {
    refine entity-class {
      default POLICY-METADATA-DECORATOR-TYPE;
    }
  }
  leaf supa-has-policy-metadata-dec-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref())/entity-class,
    'SUPA-HAS-POLICY-METADATA-DECORATOR-DETAIL-ASSOC')";
    description
      "This leaf-list holds instance-identifiers that
      reference a SUPAHasMetadaDecorator association [1].
      This association is represented by the grouping
      supa-has-policy-metadata-dec-detail. This association
      describes how a SUPAPolicyMetadataDecorator instance
      wraps a given SUPAPolicyMetadata instance
      using the Decorator pattern [1]. Multiple concrete
      subclasses of SUPAPolicyMetadataDecorator may be used
      to wrap the same SUPAPolicyMetadata instance. Since
      this association class contains attributes, the
      instance-identifier MUST point to an instance using
      the grouping supa-has-policy-metadata-dec-detail (which
      includes subclasses of this association class).";
```

```

    }
    description
        "This object implements the Decorator pattern [1] for all
        SUPA metadata objects. This enables all or part of one or
        more metadata objects to wrap another concrete metadata
        object. The only concrete subclass of SUPAPolicyMetadata
        in this document is SUPAPolicyConcreteMetadata.";
}

```

```

identity POLICY-METADATA-DECORATOR-ACCESS-TYPE {
    base POLICY-METADATA-DECORATOR-TYPE;
    description
        "The identity corresponding to a
        SUPAPolicyAccessMetadataDef object instance.";
}

grouping supa-policy-metadata-decorator-access-type {
    uses supa-policy-metadata-decorator-type {
        refine entity-class {
            default POLICY-METADATA-DECORATOR-ACCESS-TYPE;
        }
    }
    leaf supa-policy-metadata-access-priv-def {
        type enumeration {
            enum "error" {
                description
                    "This signifies an error state. OAM&P Policies
                    SHOULD NOT use this SUPAPolicyAccessMetadataDef
                    if the value of this attribute is error.";
            }
            enum "init" {
                description
                    "This signifies an initialization state.";
            }
            enum "read only" {
                description
                    "This defines access as read only for ALL
                    SUPAPolicyObject objects that are adorned
                    with this SUPAPolicyAccessMetadataDef object.
                    As such, an explicit access control model,
                    such as RBAC [7], is NOT present.";
            }
            enum "read write" {
                description

```

```

        "This defines access as read and/or write for
        ALL SUPAPolicyObject objects that are adorned
        with this SUPAPolicyAccessMetadataDef object.
        As such, an explicit access control model,
        such as RBAC [7], is NOT present.";
    }
    enum "specified by MAC" {
        description
            "This uses an external Mandatory Access Control
            (MAC) [7] model to define access control for
            ALL SUPAPolicyObject objects that are adorned
            with this SUPAPolicyAccessMetadataDef object.
            The name and location of this access control
            model are specified, respectively, in the

```

```

        supa-policy-metadata-access-priv-model-name
        and supa-policy-metadata-access-priv-model-ref
        attributes of this SUPAPolicyAccessMetadataDef
        object.";
    }
    enum "specified by DAC" {
        description
            "This uses an external Discretionary Access
            Control (DAC) [7] model to define access
            control for ALL SUPAPolicyObject objects that
            are adorned with this
            SUPAPolicyAccessMetadataDef object. The name
            and location of this access control model are
            specified, respectively, in the
            supa-policy-metadata-access-priv-model-name
            and supa-policy-metadata-access-priv-model-ref
            attributes of this SUPAPolicyAccessMetadataDef
            object.";
    }
    enum "specified by RBAC" {
        description
            "This uses an external Role-Based Access Control
            (RBAC) [7] model to define access control for
            ALL SUPAPolicyObject objects that are adorned
            with this SUPAPolicyAccessMetadataDef object.
            The name and location of this access control
            model are specified, respectively, in the
            supa-policy-metadata-access-priv-model-name

```

```

        and supa-policy-metadata-access-priv-model-ref
        attributes of this SUPAPolicyAccessMetadataDef
        object.";
    }
    enum "specified by ABAC" {
        description
            "This uses an external Attribute-Based Access
            Control (ABAC) [8] model to define access
            control for ALL SUPAPolicyObject objects that
            are adorned with this
            SUPAPolicyAccessMetadataDef object. The name
            and location of this access control model are
            specified, respectively, in the
            supa-policy-metadata-access-priv-model-name
            and supa-policy-metadata-access-priv-model-ref
            attributes of this SUPAPolicyAccessMetadataDef
            object.";
    }
    enum "specified by custom" {
        description
            "This uses an external Custom Access Control
            model to define access control for ALL
            SUPAPolicyObject objects that are adorned
            with this SUPAPolicyAccessMetadataDef object.

```

```

        The name and location of this access control
        model are specified, respectively, in the
        supa-policy-metadata-access-priv-model-name
        and supa-policy-metadata-access-priv-model-ref
        attributes of this SUPAPolicyAccessMetadataDef
        object.";
    }
}
description
    "This defines the type of access control model that is
    used by this SUPAPolicyObject object instance.";
}
leaf supa-policy-metadata-access-priv-model-name {
    type string;
    description
        "This contains the name of the access control model
        being used. If the value of the
        supa-policy-metadata-access-priv-model-ref is
        error, then this SUPAPolicyAccessMetadataDef object
        MUST NOT be used. If the value of the

```



```

        supa-policy-metadata-access-priv-model-ref is init,
        then this SUPAPolicyAccessMetadataDef object has been
        properly initialized, and is ready to be used. If the
        value of the supa-policy-metadata-access-priv-model-ref
        is read only or read write, then the value of this
        attribute is not applicable (because a type of model
        is NOT being defined; instead, the access control for
        all SUPAPolicyObjects is being defined).
        Otherwise, the text in this class attribute SHOULD be
        interpreted according to the value of the
        supa-policy-metadata-access-priv-model-ref class
        attribute.";
    }
    leaf supa-policy-metadata-access-priv-model-ref {
        type enumeration {
            enum "error" {
                description
                    "This signifies an error state. OAM&P Policies
                     SHOULD NOT use this SUPAPolicyAccessMetadataDef
                     object if the value of this attribute is
                     error.";
            }
            enum "init" {
                description
                    "This signifies an initialization state.";
            }
            enum "URI" {
                description
                    "The access control model is referenced by
                     this URI.";
            }
        }
    }

```

```

    enum "GUID" {
        description
            "The access control model is referenced by
             this GUID.";
    }
    enum "UUID" {
        description
            "The access control model is referenced by
             this UUID.";
    }
    enum "FQDN" {
        description

```

```

        "The access control model is referenced by
        this FQDN.";
    }
    enum "FQPN" {
        description
            "The access control model is referenced by
            this FQPN.";
    }
    enum "string_instance_id" {
        description
            "A string that is the canonical representation,
            in ASCII, of an instance ID of this object.";
    }
    }
    description
        "This defines the data type of the
        supa-policy-metadata-access-priv-model-name
        attribute.";
}
description
    "This is a concrete class that defines metadata for access
    control information that can be added to any
    SUPAPolicyObject object instance.
    This is done using the SUPAHasPolicyMetadata association
    in conjunction with the Decorator pattern [1].";
}

container supa-policy-metadata-decorator-access-container {
    description
        "This is a container to collect all object instances of
        type SUPAPolicyAccessMetadataDef.";
    list supa-policy-metadata-decorator-access-list {
        key supa-policy-metadata-id;
        uses supa-policy-metadata-decorator-type;
        description
            "A list of all supa-policy-metadata-decorator-access
            instances in the system. Instances of subclasses
            will be in a separate list.";
    }
}
}

```

```

identity POLICY-METADATA-DECORATOR-VERSION-TYPE {
    base POLICY-METADATA-DECORATOR-TYPE;
    description
        "The identity corresponding to a

```

```

        SUPAPolicyVersionMetadataDef object instance.";
    }

    grouping supa-policy-metadata-decorator-version-type {
        uses supa-policy-metadata-decorator-type {
            refine entity-class {
                default POLICY-METADATA-DECORATOR-VERSION-TYPE;
            }
        }
    }
    leaf supa-policy-metadata-version-major {
        type string;
        description
            "This contains a string representation of an integer
            that is greater than or equal to zero. It indicates
            that a significant increase in functionality is present
            in this version. It MAY also indicate that this version
            has changes that are NOT backwards-compatible (the
            supa-policy-metadata-version-build class attribute is
            used to denote such changes). The string 0.1.0
            defines an initial version that MUST NOT be considered
            stable. Improvements to this initial version are
            denoted by incrementing the minor and patch class
            attributes (supa-policy-metadata-version-major and
            supa-policy-metadata-version-patch, respectively). The
            major version X (i.e., X.y.z, where X > 0) MUST be
            incremented if any backwards-incompatible changes are
            introduced. It MAY include minor and patch level
            changes. The minor and patch version numbers MUST be
            reset to 0 when the major version number is
            incremented.";
    }
    leaf supa-policy-metadata-version-minor {
        type string;
        description
            "This contains a string representation of an integer
            that is greater than or equal to zero. It indicates
            that this release contains a set of features and/or
            bug fixes that MUST be backwards-compatible. The
            minor version Y (i.e., x.Y.z, where x > 0) MUST be
            incremented if new, backwards-compatible changes are
            introduced. It MUST be incremented if any features are
            marked as deprecated. It MAY be incremented if new
            functionality or improvements are introduced, and MAY
            include patch level changes. The patch version number
            MUST be reset to 0 when the minor version number is
            incremented.";
    }
}

```

```
leaf supa-policy-metadata-version-patch {
    type string;
    description
        "This contains a string representation of an integer
        that is greater than or equal to zero. It indicates
        that this version contains ONLY bug fixes. The patch
        version Z (i.e., x.y.Z, where x > 0) MUST be
        incremented if new, backwards-compatible changes are
        introduced. A bug fix is defined as an internal change
        that fixes incorrect behavior.";
}
leaf supa-policy-metadata-version-prerelease {
    type string;
    description
        "This contains a string that defines the pre-release
        version. A pre-release version MAY be denoted by
        appending a hyphen and a series of dot-separated
        identifiers immediately following the patch version.
        Identifiers MUST comprise only ASCII alphanumerics and
        a hyphen. Identifiers MUST NOT be empty. Numeric
        identifiers MUST NOT include leading zeroes.
        Pre-release versions have a lower precedence than the
        associated normal version. A pre-release version
        indicates that the version is unstable and might not
        satisfy the intended compatibility requirements as
        denoted by its associated normal version. Examples
        include: 1.0.0-alpha and 1.0.0-0.3.7.";
}
leaf supa-policy-metadata-version-build {
    type string;
    description
        "This contains a string that defines the metadata of
        this build. Build metadata is optional. If present,
        build metadata MAY be denoted by appending a plus
        (+) sign to the version, followed by a series of
        dot-separated identifiers. This may follow either
        the patch or pre-release portions of the version.
        If build metadata is present, then any identifiers
        that it uses MUST be made up of only ASCII
        alphanumerics and a hyphen. The identifier portion of
        the build metadata MUST NOT be empty. Build metadata
        SHOULD be ignored when determining version precedence.
        Examples include: 1.0.0.-alpha+1, 1.0.0.-alpha+1.1,
        1.0.0+20130313144700, and 1.0.0-beta+exp.sha.5114f85.";
}
description
    "This is a concrete class that defines metadata for version
    control information that can be added to any
```

SUPAPolicyObject. This is done using the SUPAHasPolicyMetadata association. This class uses the Semantic Versioning Specification [6] as follows:

```
    <major>.<minor>.<patch>[<pre-release>][<build-metadata>]
    where the first three components (major, minor, and patch)
    MUST be present, and the latter two components (pre-release
    and build-metadata) MAY be present. A version number MUST
    take the form <major>.<minor>.<patch>, where <major>,
    <minor>, and <patch> are each non-negative integers that
    MUST NOT contain leading zeros. In addition, the value of
    each of these three elements MUST increase numerically.
    In this approach, supaVersionMajor denotes a new release;
    supaVersionMinor denotes a minor release; supaVersionPatch
    denotes a version that consists ONLY of bug fixes. Version
    precedence MUST be calculated by separating the version
    into major, minor, patch, and pre-release identifiers, in
    that order. See [1] for more information.";
}

container supa-policy-metadata-decorator-version-container {
  description
    "This is a container to collect all object instances of
    type SUPAPolicyVersionMetadataDef.";
  list supa-policy-metadata-decorator-version-list {
    key supa-policy-metadata-id;
    uses supa-policy-metadata-decorator-type;
    description
      "A list of all supa-policy-metadata-decorator-version
      instances in the system. Instances of subclasses
      will be in a separate list.";
  }
}

identity SUPA-HAS-POLICY-METADATA-DECORATOR-TYPE {
  base POLICY-OBJECT-TYPE;
  description
    "The identity corresponding to a
    SUPAHasPolicyMetadataDetail association class
    object instance.";
}

grouping supa-has-policy-metadata-detail {
  uses supa-policy-object-type {
```

```

    refine entity-class {
        default SUPA-HAS-POLICY-METADATA-DECORATOR-TYPE;
    }
}
leaf supa-has-policy-metadata-detail-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
        'POLICY-OBJECT-TYPE'))";
    description

```

```

    "This leaf is an instance-identifier that references a
    concrete subclass of the SUPAPolicyObject instance end
    point of the aggregation represented by this instance of
    the SUPAHasPolicyMetadata aggregation [1]. The
    groupings supa-policy-object-type and
    supa-policy-metadata-type represent the
    SUPAPolicyObject and SUPAPolicyMetadata classes,
    respectively. Thus, the instance identified by this
    leaf is the SUPAPolicyObject instance that is
    associated by this aggregation to the set of
    SUPAPolicyMetadata instances referenced by the
    supa-has-policy-metadata-detail-part-ptr leaf of
    this grouping.";
}
leaf supa-has-policy-metadata-detail-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
        'POLICY-METADATA-TYPE'))";
    description
        "This leaf is an instance-identifier that references
        the SUPAPolicyMetadata instance end point of the
        aggregation represented by this instance of the
        SUPAHasPolicyMetadata aggregation [1]. The groupings
        supa-policy-object-type and supa-policy-metadata-type
        represent the SUPAPolicyObject and SUPAPolicyMetadata
        classes, respectively. Thus, the instance
        identified by this leaf is the SUPAPolicyMetadata
        instance that is associated by this aggregation to
        the set of SUPAPolicyObject instances referenced by
        the supa-has-policy-metadata-detail-agg-ptr leaf of
        this grouping.";
}

```

```

leaf supa-policy-metadata-detail-is-applicable {
    type boolean;
    description
        "This attribute controls whether the associated
        metadata is currently considered applicable to this
        SUPAPolicyObject; this enables metadata to be turned
        on and off when needed without disturbing the
        structure of the object that the metadata applies to,
        or affecting other objects in the system.";
}
leaf-list supa-policy-metadata-detail-constraint {
    type string;
    description
        "A list of constraints, expressed as strings, in
        the language defined by the
        supa-policy-metadata-detail-encoding attribute.

```

```

        If there are no constraints on using this
        SUPAPolicyMetadata object with this particular
        SUPAPolicyObject object, then this leaf-list will
        consist of a list of a single null string.";
    }
    leaf supa-policy-metadata-detail-constraint-encoding {
        type identityref {
            base POLICY-CONSTRAINT-LANGUAGE-LIST;
        }
        description
            "The language in which the constraints on the
            SUPAHasPolicyMetadata aggregation is expressed.
            Examples include OCL 2.4 [2], Alloy [3], and
            English text.";
    }
    description
        "This is a concrete association class that defines the
        semantics of the SUPAHasPolicyMetadata association. This
        enables the attributes and relationships of the
        SUPAHasPolicyMetadataDetail class to be used to constrain
        which SUPAPolicyMetadata objects can be associated by
        this particular SUPAPolicyObject instance.";
}

```

```

container supa-policy-metadata-detail-container {
  description
    "This is a container to collect all object instances of
    type SUPAPolicyMetadataDetail.";
  list supa-policy-metadata-detail-list {
    key supa-policy-ID;
    uses supa-has-policy-metadata-detail;
    description
      "This is a list of all supa-policy-metadata-detail
      instances in the system. Instances of subclasses
      will be in a separate list. Note that this association
      class is made concrete for exemplary purposes. To be
      useful, it almost certainly needs refinement.";
  }
}

```

```

// Editor's note: For simplicity, this version of this document assumes
//                 that the SUPAPolicyObject and SUPAMetadata object
//                 hierarchies are separate and do NOT have a common
//                 superclass. Hence, there are two separate IDs used by
//                 associations and association classes,
//                 POLICY-OBJECT-TYPE and POLICY-METADATA-TYPE (for the
//                 SUPAPolicyObject and SUPAPolicyMetadata associations,
//                 respectively). Future implementations should examine
//                 the merit of defining a common superclass for these
//                 two class hierarchies in order to give all
//                 associations and association classes a common ID.

```

```

identity SUPA-POLICY-CLAUSE-HAS-DECORATOR-ASSOC {
  base POLICY-OBJECT-TYPE;
  description
    "The identity corresponding to a
    SUPAPolicyClauseHasDecorator association class
    object instance.";
}

grouping supa-policy-clause-has-decorator-detail {
  leaf supa-policy-clause-has-decorator-agg-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref())/entity-class,
    'SUPA-POLICY-CLAUSE-HAS-DECORATOR-ASSOC'";
    description
      "This leaf-list holds instance-identifiers that

```



```

reference a SUPAPolicyClauseHasDecorator aggregation
[1], and is represented by the grouping
supa-policy-clause-has-decorator-detail. This
aggregation describes how each SUPAPolicyClause
object instance is decorated (i.e., wrapped) by zero
or more SUPAPolicyClauseComponentDecorator object
instances. For example, this aggregation may restrict
which concrete subclasses of the
SUPAPolicyClauseComponentDecorator class can wrap
this particular concrete subclass of the
SUPAPolicyClause class. The set of SUPAPolicyClauses,
identified by this leaf-list, define the content of
this SUPAPolicyStructure that they are associated
with (via the SUPAHasPolicyClause aggregation).
Since this association class contains attributes, the
instance-identifier MUST point to an instance using
the grouping supa-policy-clause-has-decorator-detail
(which includes subclasses of this association
class). Note that (concrete) subclasses of this
association class may also be used to further refine
the semantics of this aggregation.";
}
leaf supa-policy-clause-has-decorator-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref())/entity-class,
        'SUPA-POLICY-CLAUSE-HAS-DECORATOR-ASSOC')";
    description
        "This leaf holds instance-identifiers that
        reference a SUPAPolicyClauseHasDecorator aggregation,
        [1], and is represented by the grouping
        supa-policy-clause-has-decorator-detail. This
        aggregation describes how each
        SUPAPolicyClauseComponentDecorator object instance
        wraps a given SUPAPolicyClause object instance. This
        enables the behavior of a SUPAPolicyClause object

```

instance to be changed dynamically by attaching and/or removing SUPAPolicyClauseComponentDecorator object instances. Multiple SUPAPolicyClauseComponentDecorator object instances may be attached to a SUPAPolicyClause object instance that is referenced in this aggregation by using the Decorator pattern [1]. Since this association class contains attributes, the instance-identifier MUST point to an instance using

```

        the grouping supra-policy-clause-has-decorator-detail.";
    }
    leaf-list supra-pol-clause-dec-constraint {
        type string;
        description
            "A constraint expression applying to this association
            between a concrete subclass of SUPAPolicyClause and a
            concrete subclass of
            SUPAPolicyClauseComponentDecorator. This restricts
            which types of SUPAPolicyClauseComponentDecorator
            object instances can be aggregated by which types of
            SUPAPolicyClause object instances. Constraints are
            written in a constraint language specified by the
            supra-pol-clause-dec-constraint-encoding attribute.";
    }
    leaf supra-pol-clause-dec-constraint-encoding {
        type identityref {
            base POLICY-CONSTRAINT-LANGUAGE-LIST;
        }
        description
            "The language in which the constraints on the
            SUPAPolicyClauseHasDecorator aggregation is expressed.
            Examples include OCL 2.4 [2], Alloy [3], and
            English text.";
    }
    description
        "This is a concrete association class that defines the
        semantics of the SUPAPolicyClauseHasDecorator
        aggregation.";
}

container supra-policy-clause-has-decorator-detail-container {
    description
        "This is a container to collect all object instances of
        type SUPAPolicyClauseHasDecoratorDetail.";
    list supra-policy-component-decorator-detail-list {
        key supra-policy-ID;
        uses supra-has-decorator-policy-component-detail;
        description
            "This is a list of all
            supra-policy-component-decorator-details.";
    }
}

```

```

grouping supa-has-decorator-policy-component-detail {
  uses supa-policy-object-type {
    refine entity-class {
      default SUPA-HAS-DECORATED-POLICY-COMPONENT-ASSOC;
    }
  }
  leaf supa-has-policy-component-decorator-aggr-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
      'POLICY-COMPONENT-DECORATOR-TYPE'))";
    description
      "This leaf is an instance-identifier that references
        the SUPAPolicyComponentDecorator instance end point of
        the association represented by this instance of the
        SUPAHasDecoratedPolicyComponent association [1]. The
        groupings supa-policy-component-decorator-type and
        supa-policy-component-structure-type represent the
        SUPAPolicyComponentDecorator and
        SUPAPolicyComponentStructure classes, respectively.
        Thus, the instance identified by this leaf is the
        SUPAPolicyComponentDecorator instance that is
        associated by this association to the set of
        SUPAPolicyComponentStructure instances referenced by
        the supa-has-policy-component-decorator-part-ptr leaf
        of this grouping.";
  }
  leaf supa-has-policy-component-decorator-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
      'POLICY-COMPONENT-TYPE'))";
    description
      "This leaf is an instance-identifier that references
        the SUPAPolicyComponentStructure instance end point of
        the association represented by this instance of the
        SUPAHasDecoratedPolicyComponent association [1].
        The groupings supa-policy-component-decorator-type and
        supa-policy-component-structure-type represent the
        SUPAPolicyComponentDecorator and
        SUPAPolicyComponentStructure classes, respectively.
        Thus, the instance identified by this leaf is the
        SUPAPolicyComponentStructure instance that is
        associated by this association to the set of
        SUPAPolicyComponentStructure instances referenced by
        the supa-has-policy-component-decorator-aggr-ptr leaf
        of this grouping.";
  }
  leaf-list supa-has-decorator-constraint {
    type string;
    description

```

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```
        "A constraint expression applying to this association
        between a SUPAPolicyClauseComponentDecorator and any
        components that decorate it. The
        supa-has-decorator-constraint-encoding attribute
        specifies the language used to write the set of
        constraint expressions.";
    }
    leaf supa-has-decorator-constraint-encoding {
        type identityref {
            base POLICY-CONSTRAINT-LANGUAGE-LIST;
        }
        description
            "The language in which the constraints on the
            SUPAHasDecoratedPolicyComponent aggregation is
            expressed. Examples include OCL 2.4 [2], Alloy [3],
            and English text.";
    }
    description
        "This is a concrete association class that defines the
        semantics of the SUPAHasDecoratedPolicyComponent
        association. The purpose of this class is to use the
        Decorator pattern [1] to determine which
        SUPAPolicyComponentDecorator object instances, if any,
        are required to augment the functionality of a concrete
        subclass of SUPAPolicyClause that is being used.";
}

container supa-policy-component-decorator-detail-container {
    description
        "This is a container to collect all object instances of
        type SUPAPolicyComponentDecoratorDetail.";
    list supa-policy-component-decorator-detail-list {
        key supa-policy-ID;
        uses supa-has-decorator-policy-component-detail;
        description
            "This is a list of all
            supa-policy-component-decorator-details.";
    }
}

identity SUPA-HAS-DECORATED-POLICY-COMPONENT-ASSOC {
    base POLICY-OBJECT-TYPE;
```

```

    description
        "The identity corresponding to a
        SUPAHasDecoratedPolicyComponent association
        object instance.";
}

```

```

identity SUPA-HAS-POLICY-SOURCE-ASSOC {
    base POLICY-OBJECT-TYPE;
    description
        "The identity corresponding to a SUPAHasPolicySource
        association class object instance.";
}

grouping supa-has-policy-source-detail {
    uses supa-policy-object-type {
        refine entity-class {
            default SUPA-HAS-POLICY-SOURCE-ASSOC;
        }
    }
    leaf supa-has-policy-source-detail-agg-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref())/entity-class,
            'POLICY-STRUCTURE-TYPE')";
        description
            "This leaf is an instance-identifier that references
            a SUPAPolicyStructure instance end point of the
            association represented by this instance of the
            SUPAHasPolicySource association [1]. The grouping
            supa-has-policy-source-detail represents the
            SUPAHasPolicySourceDetail class. Thus, the instance
            identified by this leaf is the SUPAPolicyStructure
            instance that is associated by this association to the
            SUPAPolicySource instance referenced by the
            supa-has-policy-source-detail-part-ptr leaf of
            this grouping.";
    }
    leaf supa-has-policy-source-detail-part-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref())/entity-class,
            'POLICY-SOURCE-TYPE')";
        description

```

```

        "This leaf is an instance-identifier that references
        a SUPAPolicySource instance end point of the
        association represented by this instance of the
        SUPAHasPolicySource association [1]. The grouping
        supa-has-policy-source-detail represents the
        SUPAHasPolicySourceDetail class. Thus, the instance
        identified by this leaf is the SUPAPolicySource
        instance that is associated by this association to the
        SUPAPolicyStructure instance referenced by the
        supa-has-policy-source-detail-agg-ptr leaf of
        this grouping.";
    }

```

```

    leaf supa-policy-source-is-authenticated {
        type boolean;
        description
            "If the value of this attribute is true, then this
            SUPAPolicySource object has been authenticated by
            a policy engine or application that is executing this
            particular SUPAPolicyStructure object.";
    }
    leaf supa-policy-source-is-trusted {
        type boolean;
        description
            "If the value of this attribute is true, then this
            SUPAPolicySource object has been verified to be
            trusted by a policy engine or application that is
            executing this particular SUPAPolicyStructure object.";
    }
    description
        "This is an association class, and defines the semantics of
        the SUPAHasPolicySource association. The attributes and
        relationships of this class can be used to define which
        SUPAPolicySource objects can be attached to which
        particular set of SUPAPolicyStructure objects. Note that a
        SUPAPolicySource object is NOT responsible for evaluating
        or executing SUPAPolicies; rather, it identifies the set
        of entities that are responsible for managing this
        SUPAPolicySource object. Its primary uses are for
        auditability, as well as processing deontic logic. This

```

```

        object represents the semantics of associating a
        SUPAPolicySource to a SUPAPolicyTarget.";
    }

    container supa-policy-source-detail-container {
        description
            "This is a container to collect all object instances of
            type SUPAPolicySourceDetail.";
        list supa-policy-source-detail-list {
            key supa-policy-ID;
            uses supa-has-policy-source-detail;
            description
                "This is a list of all supa-policy-source-detail
                objects.";
        }
    }

    identity SUPA-HAS-POLICY-TARGET-ASSOC {
        base POLICY-OBJECT-TYPE;
        description
            "The identity corresponding to a SUPAHasPolicyTarget
            association class object instance.";
    }

```

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```

    grouping supa-has-policy-target-detail {
        uses supa-policy-object-type {
            refine entity-class {
                default SUPA-HAS-POLICY-TARGET-ASSOC;
            }
        }
        leaf supa-has-policy-target-detail-agg-ptr {
            type instance-identifier;
            must "derived-from-or-self (deref(./entity-class,
                'POLICY-STRUCTURE-TYPE'))";
            description
                "This leaf is an instance-identifier that references
                a SUPAPolicyStructure instance end point of the
                association represented by this instance of the
                SUPAHasPolicyTarget association [1]. The grouping
                supa-has-policy-target-detail represents the
                SUPAHasPolicyTargetDetail class. Thus, the instance
                identified by this leaf is the SUPAPolicyStructure

```

```

        instance that is associated by this association to the
        SUPAPolicyTarget instance referenced by the
        supa-has-policy-target-detail-part-ptr leaf of
        this grouping.";
    }
    leaf supa-has-policy-target-detail-part-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref(./entity-class,
            'POLICY-TARGET-TYPE'))";
        description
            "This leaf is an instance-identifier that references
            a SUPAPolicyTarget instance end point of the
            association represented by this instance of the
            SUPAHasPolicyTarget association [1]. The grouping
            supa-has-policy-target-detail represents the
            SUPAHasPolicyTargetDetail class. Thus, the instance
            identified by this leaf is the SUPAPolicyTarget
            instance that is associated by this association to the
            SUPAPolicyStructure instance referenced by the
            supa-has-policy-target-detail-agg-ptr leaf of
            this grouping.";
    }
    leaf supa-policy-target-is-authenticated {
        type boolean;
        description
            "If the value of this attribute is true, then this
            SUPAPolicyTarget object has been authenticated by
            a policy engine or application that is executing this
            particular SUPAPolicyStructure object.";
    }
}

```

```

    leaf supa-policy-target-is-enabled {
        type boolean;
        description
            "If the value of this attribute is true, then each
            SUPAPolicyTarget object that is referenced by this
            SUPAHasPolicyTarget aggregation is able to be used as
            a SUPAPolicyTarget by the SUPAPolicyStructure object
            that is referenced by this SUPAHasPolicyTarget
            aggregation. This means that this SUPAPolicyTarget has
            agreed to: 1) have SUPAPolicies applied to it, and 2)
            process (directly or with the aid of a proxy) one or

```



```

        more SUPAPolicies, or receive the results of a
        processed SUPAPolicy and apply those results to
        itself.";
    }
    description
        "This is an association class, and defines the semantics of
        the SUPAHasPolicyTarget association. The attributes and
        relationships of this class can be used to define which
        SUPAPolicyTarget objects can be attached to which
        particular set of SUPAPolicyStructure objects. Note that a
        SUPAPolicyTarget is used to identify a set of managed
        entities to which a SUPAPolicy should be applied; this
        object represents the semantics of applying a SUPAPolicy
        to a SUPAPolicyTarget.";
}

container supa-policy-target-detail-container {
description
    "This is a container to collect all object instances of
    type SUPAPolicyTargetDetail.";
    list supa-policy-target-detail-list {
        key supa-policy-ID;
        uses supa-has-policy-target-detail;
        description
            "This is a list of all supa-policy-target-detail
            objects.";
    }
}

identity SUPA-HAS-POLICY-METADATA-ASSOC {
    base POLICY-METADATA-TYPE;
    description
        "The identity corresponding to a SUPAHasPolicyMetadata
        association class object instance.";
}

```

```

identity SUPA-HAS-POLICY-CLAUSE-ASSOC {
    base POLICY-OBJECT-TYPE;

```

```

description
    "The identity corresponding to a SUPAHasPolicyClause
    association class object instance.";
}

grouping supa-has-policy-clause-detail {
    uses supa-policy-object-type {
        refine entity-class {
            default SUPA-HAS-POLICY-CLAUSE-ASSOC;
        }
    }
    leaf-list supa-has-policy-clause-detail-agg-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref(./entity-class,
            'POLICY-STRUCTURE-TYPE'))";
        description
            "This leaf is an instance-identifier that references
            a concrete subclass of the SUPAPolicyStructure class
            end point of the association represented by this
            instance of the SUPAHasPolicyClause association [1].
            The grouping supa-has-policy-clause-detail represents
            the SUPAHasPolicyClauseDetail association class. Thus,
            the instance identified by this leaf is the
            SUPAPolicyStructure instance that is associated by
            this association to the set of SUPAPolicyClause
            instances referenced by the
            supa-has-policy-clause-detail-part-ptr leaf of this
            grouping.";
    }
    leaf supa-has-policy-clause-detail-part-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref(./entity-class,
            'POLICY-CLAUSE-TYPE'))";
        description
            "This leaf is an instance-identifier that references
            a concrete subclass of the SUPAPolicyClause class
            end point of the association represented by this
            instance of the SUPAHasPolicyClause association [1].
            The grouping supa-has-policy-clause-detail represents
            the SUPAHasPolicyClauseDetail association class. Thus,
            the instance identified by this leaf is the
            SUPAPolicyClause instance that is associated by this
            association to the set of SUPAPolicyStructure
            instances referenced by the
            supa-has-policy-clause-detail-agg-ptr leaf of this
            grouping.";
    }
}

```

```
    description
        "This is an association class, and defines the semantics of
        the SUPAHasPolicyClause association. The attributes and
        relationships of this class can be used to define which
        SUPAPolicyTarget objects can be used by which particular
        set of SUPAPolicyStructure objects. Every
        SUPAPolicyStructure instance MUST aggregate at
        least one SUPAPolicyClause instance. However, the
        converse is NOT true. For example, a SUPAPolicyStructure
        instance MUST aggregate at least one SUPAPolicyClause
        instance. However, a SUPAPolicyClause object could be
        instantiated and then stored for later use in a policy
        repository.";
}

container supa-policy-clause-detail-container {
    description
        "This is a container to collect all object instances of
        type SUPAPolicyClauseDetail.";
    list supa-policy-clause-detail-list {
        key supa-policy-ID;
        uses supa-has-policy-clause-detail;
        description
            "This is a list of all supa-policy-clause-detail
            objects.";
    }
}

identity SUPA-HAS-POLICY-EXEC-ACTION-ASSOC {
    base POLICY-OBJECT-TYPE;
    description
        "The identity corresponding to a
        SUPAHasPolExecFailActionToTake association class
        object instance.";
}

grouping supa-has-policy-exec-action-detail {
    uses supa-policy-object-type {
        refine entity-class {
            default SUPA-HAS-POLICY-EXEC-ACTION-ASSOC;
        }
    }
    leaf supa-has-exec-fail-action-detail-aggr-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref(./entity-class,
            'POLICY-STRUCTURE-TYPE'))";
    }
}
```

description

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```
    "This leaf is an instance-identifier that references
      a SUPAPolicyStructure instance end point of the
      association represented by this instance of the
      SUPAHasPolExecFailActionToTake association [1] that
      was executing a SUPAPolicy. This SUPAPolicyStructure
      is referred to as the 'parent' SUPAPolicyStructure
      instance, while the other instance end point of this
      association is called the 'child' SUPAPolicyStructure.
      The grouping supa-policy-structure-type represents the
      SUPAPolicyStructure class. Thus, the instance
      identified by this leaf is the parent
      SUPAPolicyStructure instance that is associated by this
      association to the child SUPAPolicyStructure instance
      referenced by the
      supa-has-exec-fail-action-detail-part-ptr leaf of this
      grouping.";
  }
  leaf supa-has-exec-fail-action-detail-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref(./entity-class,
      'POLICY-STRUCTURE-TYPE'))";
    description
      "This leaf is an instance-identifier that references
        a SUPAPolicyStructure instance end point of the
        association represented by this instance of the
        SUPAHasPolExecFailActionToTake association [1] that
        was NOT currently executing a SUPAPolicy. This
        SUPAPolicyStructure is referred to as the 'child'
        SUPAPolicyStructure instance, while the other instance
        end point of this association is called the 'parent'
        SUPAPolicyStructure. The grouping
        supa-policy-structure-type represents the
        SUPAPolicyStructure class. Thus, the instance
        identified by this leaf is the child
        SUPAPolicyStructure instance that is associated by
        this association to the child SUPAPolicyStructure
        instance referenced by the
        supa-has-exec-fail-action-detail-part-ptr leaf of
        this grouping.";
```

```

}
leaf-list supa-policy-exec-fail-take-action-name {
    type string;
    description
        "This is a list that contains the set of names for
        SUPAPolicyActions to use if the SUPAPolicyStructure
        object that owns this association failed to execute
        properly. This association defines a set of child
        SUPAPolicyStructure objects to use if this (the parent)
        SUPAPolicyStructure object fails to execute correctly.

```

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```

        Each child SUPAPolicyStructure object has one or more
        SUPAPolicyActions; this attribute defines the name(s)
        of each SUPAPolicyAction in each child
        SUPAPolicyStructure that should be used to try and
        remediate the failure.";
    }
    description
        "This is an association class, and defines the semantics of
        the SUPAHasPolExecFailTakeAction association. The
        attributes and relationships of this class can be used to
        determine which SUPAPolicyAction objects are executed in
        response to a failure of the SUPAPolicyStructure object
        instance that owns this association.";
}

container supa-policy-exec-fail-take-action-detail-container {
    description
        "This is a container to collect all object instances of
        type SUPAPolExecFailActionToTakeDetail.";
    list supa-policy-exec-fail-take-action-detail-list {
        key supa-policy-ID;
        uses supa-has-policy-exec-action-detail;
        description
            "This is a list of all
            supa-has-policy-exec-action-detail objects.";
    }
}

identity SUPA-HAS-POLICY-METADATA-DECORATOR-DETAIL-ASSOC {
    base POLICY-METADATA-TYPE;

```

```

description
    "The identity corresponding to a
    SUPAHasMetadataDecoratorDetail association class
    object instance.";
}

grouping supa-has-policy-metadata-dec-detail {
    uses supa-policy-metadata-type {
        refine entity-class {
            default SUPA-HAS-POLICY-METADATA-DECORATOR-DETAIL-ASSOC;
        }
    }
    leaf supa-has-policy-metadata-detail-dec-aggr-ptr {
        type instance-identifier;
        must "derived-from-or-self (deref())/entity-class,
            'POLICY-METADATA-TYPE'";
        description
            "This leaf is an instance-identifier that references
            a SUPAPolicyMetadataDecorator instance end point of
            the association represented by this instance of the

```

```

    SUPAHasMetadataDecorator association [1]. The
    grouping supa-has-policy-metadata-detail represents
    the SUPAHasMetadataDecoratorDetail association class.
    Thus, the instance identified by this leaf is the
    SUPAPolicyMetadataDecorator instance that is
    associated by this association to the set of
    SUPAPolicyMetadata instances referenced by the
    supa-has-policy-metadata-detail-dec-part-ptr leaf of
    this grouping.";
}
leaf supa-has-policy-metadata-detail-dec-part-ptr {
    type instance-identifier;
    must "derived-from-or-self (deref())/entity-class,
        'POLICY-METADATA-TYPE'";
    description
        "This leaf is an instance-identifier that references
        a SUPAPolicyMetadata instance end point of the
        association represented by this instance of the
        SUPAHasMetadataDecorator association [1]. The
        grouping supa-has-policy-metadata-detail represents
        the SUPAHasMetadataDecoratorDetail association class.
        Thus, the instance identified by this leaf is the
        SUPAPolicyMetadata instance that is associated by

```

```

        this association to the set of
        SUPAPolicyMetadataDecorator instances referenced by
        the supa-has-policy-metadata-detail-dec-agg-ptr leaf
        of this grouping.";
    }
    description
        "This is an association class, and defines the semantics of
        the SUPAHasMetadataDecorator association. The attributes
        and relationships of this class can be used to define which
        concrete subclasses of the SUPAPolicyMetadataDecorator
        class can be used to wrap which concrete subclasses of the
        SUPAPolicyMetadata class.";
}

container supa-policy-metadata-decorator-detail-container {
    description
        "This is a container to collect all object instances of
        type SUPAHasMetadataDecoratorDetail.";
    list supa-policy-metadata-decorator-detail-list {
        key supa-policy-metadata-id;
        uses supa-has-policy-metadata-dec-detail;
        description
            "This is a list of all supa-policy-metadata-detail
            objects.";
    }
}
}

```

<CODE ENDS>

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## [6.](#) IANA Considerations

No IANA considerations exist for this document.

## [7.](#) Security Considerations

TBD

## [8.](#) Acknowledgments

This document has benefited from reviews, suggestions, comments

and proposed text provided by the following members, listed in alphabetical order:

Andy Bierman  
Benoit Claise  
Berndt Zeuner  
Martin Bjorklund  
Qin Wu

## 9. References

This section defines normative and informative references for this document.

### 9.1. Normative References

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- [2] <http://www.omg.org/spec/OCL/>
- [3] <http://doc.omg.org/formal/2002-04-03.pdf>

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- [4] <http://alloy.mit.edu/alloy/>
- [5] <http://www.omg.org/spec/QVT/>
- [6] <http://semver.org/>
- [7] Definitions of DAC, MAC, and RBAC may be found here: <http://csrc.nist.gov/groups/SNS/rbac/faq.html#03>
- [8] ABAC is described here: <http://csrc.nist.gov/groups/SNS/rbac/index.html>



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